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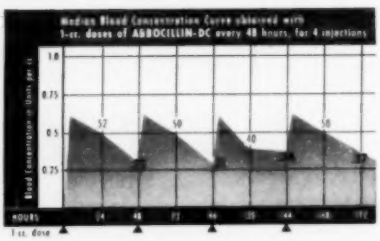

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This magazine is published to promote sound thought concerning industrial medicine and the surgery of trauma. To that end it will contain articles, news items, reports, digests, and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited. The editors will exercise care in checking on the accuracy of data printed but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same in the current or any subsequent issues as they may be inclined.

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NOTE: The opinions expressed in the editorials of this Journal are not to be considered as necessarily representing the opinions of any associated organizations.

INDUSTRIAL MEDICINE AND SURGERY, The Journal of Medicine in Industry: Entered as second class mail matter August 28, 1941, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879. Reentered, October 3, 1949. Additional entry at Sheboygan, Wisconsin. Published on the fifth of each month by INDUSTRIAL MEDICINE PUBLISHING COMPANY, Chicago (publishers also of AMERICAN INDUSTRIAL HYGIENE ASSOCIATION QUARTERLY). STEPHEN G. HALOS, President; A. D. CLOUD, Publisher; CAREY P. McCORD, M.D., Consultant Editor; JEAN SPENCER FELTON, M.D., Editor; HAROLD A. HOOPER, Treasurer; DORIS FLOURNOY, Editorial Assistant; STEPHEN G. HALOS, Advertising and Business Manager. Member, Audit Bureau of Circulations. PUBLICATION, EDITORIAL and EXECUTIVE OFFICES, 605 North Michigan Avenue, Chicago 11, Illinois. Subscription $6.00 per year in the United States; $6.50 (U. S. Currency) per year in Canada; $7.00 (U. S. Currency) per year in other countries. Single copies 75 cents. Title Registered in United States Patent Office. Rd. Canada, 1942. Copyright, 1951, by Industrial Medicine Publishing Company, Chicago. CHANGE OF ADDRESS: FOUR weeks' notice required; changes cannot be made without old address as well as new; please furnish postal zone number for new address if city requires it.

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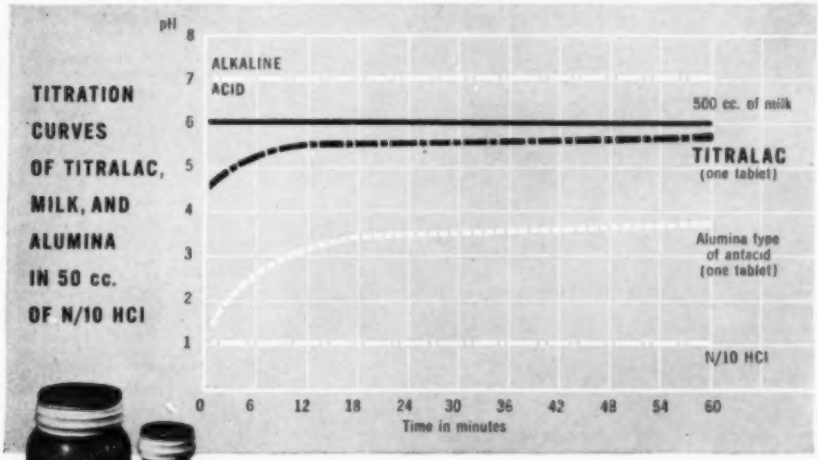

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C. RICHARD WALMER, M.D., Medical Director of the Industrial Hygiene Foundation, has been named Managing Director of that organization to succeed the late JOHN F. MCMAHON. DR. WALMER, who has been Medical Director of the Foundation and also a Senior Fellow of Mellon Institute since 1946, will now be an Administrative Fellow in the Institute. He is a widely known specialist and is on the staff of three hospitals in the Pittsburgh district. He also conducts courses of lectures at the University of Pittsburgh's School of Medicine and in its Graduate School of Public Health. In addition, he is active in numerous professional societies, and is chairman of several society committees, such as the industrial hygiene section of the Allegheny County Medical Society, and two committees of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS: the Health Achievement in Industry Award Committee and the Medical Education and Graduate Fellowship Committee. He also serves on the board of directors of this society. He is interested in all phases of public and industrial health, and is the author of a number of papers on industrial medical administration, tuberculosis, conservation of manpower, as well as general industrial hygiene and industrial medicine. DR. WALMER is the son of Mr. and Mrs. Harry A. Walmer of Wilkinsburg, Pennsylvania, where he was born in 1911, and is a graduate of Staunton Military Academy, Washington &

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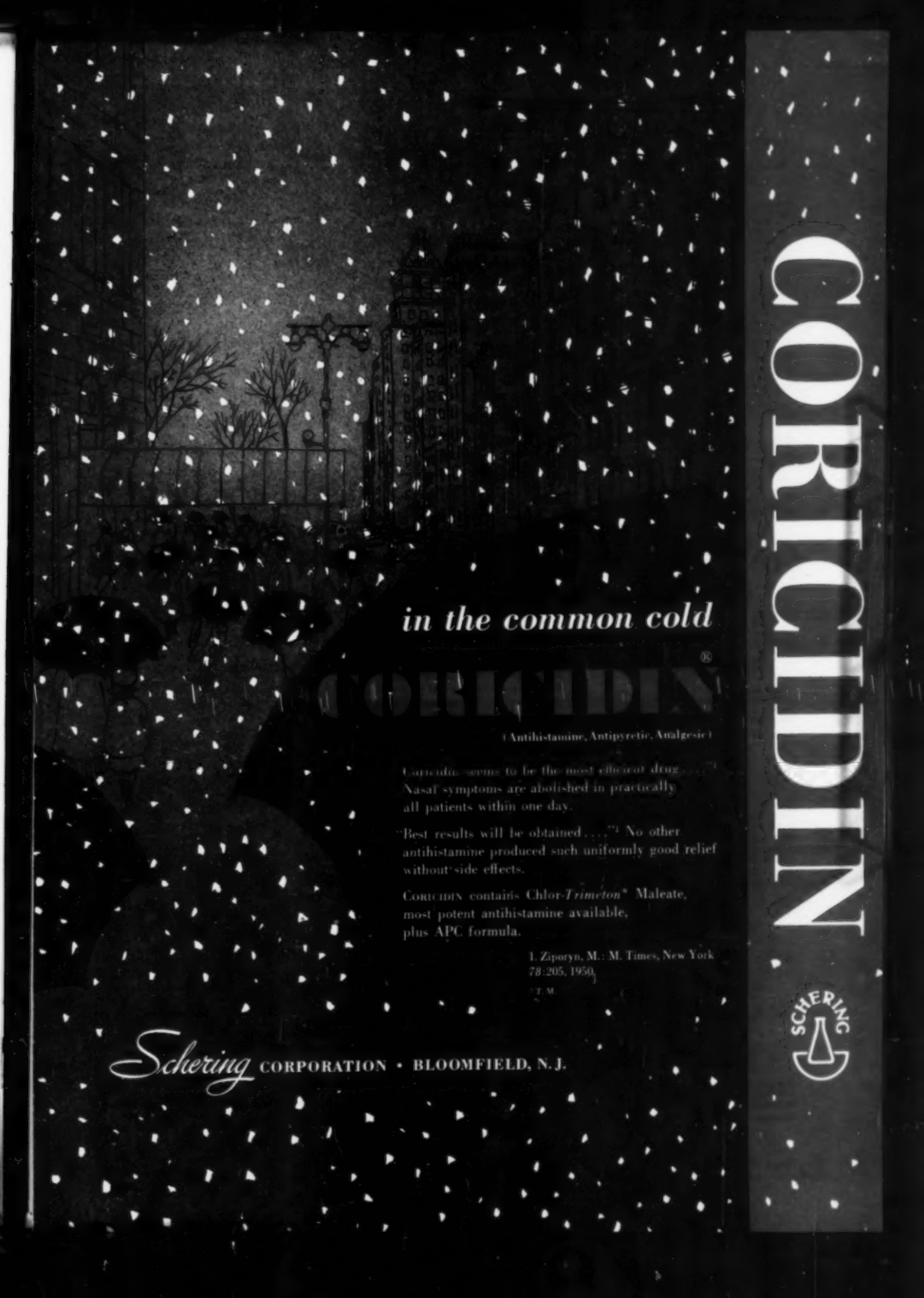
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Jefferson College, the University of Pittsburgh School of Medicine, where he received his doctor's degree in 1938, and the University of Pennsylvania Graduate School of Medicine. He served his internship at Pittsburgh Hospital and his residency at Mercy Hospital, Pittsburgh.

DURING the International Textile Exhibition at Lille—April 28 to May 20, 1951—the following days will be reserved for Occupational Medicine in the Textile Industry: May 5 and 6, 1951. Apply to: DOCTEUR MARCHAND, 76 rue Jean Bart, LILLE, FRANCE.

FREDERICK W. COE, M.D., has been appointed staff physician at the National Bureau of Standards, Washington, D.C. He will be responsible for the health and safety of 3,000 scientists and technicians working in more than 100 laboratories. DR. COE was at the Episcopal Hospital in Philadelphia from January, 1946, to June, 1949. During 1950 he studied at the Washington School of Psychiatry.

JOHN J. BLOOMFIELD, long-time Assistant Chief of the Division of Industrial Hygiene of the Public Health Service, began work last month on his new assignment with the Institute of Inter-American Affairs as Consultant on Industrial Hygiene for Latin America. He will operate in 14 Latin American countries, with which the Institute works, and review the progress of countries which already have industrial hygiene programs and also make plans for the establishment of programs in the other countries. Observing the problems of industrial health below the equator will not be new to MR. BLOOMFIELD, since he has made three previous trips to Latin America to serve as consultant for the Institute on a short-term basis. In the latter part of 1947, he spent five months in Peru and Chile, to make comprehensive studies of the hazards to workers in all industries. Early in 1947, he also spent three months in Bolivia, where he assisted in strengthening the industrial hygiene program, which was organized as a part of the labor program set up in that country with the help of the Institute. At the invitation of the Brazilian government and the Insti-

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tute, MR. BLOOMFIELD returned to Latin America in 1949 to give a series of lectures to a class of physicians and engineers. At that time, he surveyed the health conditions of workers in typical plants, mines, and mills, and made recommendations for improving the current industrial hygiene program. Many other countries in Latin America, frankly acknowledging their need for improvement, have requested assistance from the United States. MR. BLOOMFIELD plans to make surveys of the needs in the industrial hygiene field in such countries as Columbia, Venezuela, Mexico, and Uruguay. Eight of the 14 countries in which the Institute of Inter-American Affairs operates are fairly well industrialized and present a real need for industrial health programs to safeguard the health of the workers.

Atlantic City in April

THE preliminary program for the INDUSTRIAL HEALTH CONFERENCE in Atlantic City, April 21-28, 1951, will be mailed during January, covering the plans of the participating organizations of industrial physicians, industrial hygienists, industrial nurses, and industrial dentists. The Scientific Exhibits Committee is making arrangements for an interesting group of exhibits at the Conference. Prizes will be awarded for those most outstanding. Applications for space in this section should be made to ALLAN E. DOOLEY, Health Division, The Texas Company, 135 East 42nd Street, New York 17, New York. Available space for scientific exhibits will be limited; applications, therefore, should be made promptly.

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American Conference of Governmental Industrial Hygienists, U. S. Public Health Service, Washington, D. C. J. J. BLOOMFIELD, Secy-Treas. **April 22-24, 1951, Atlantic City**

American Industrial Hygiene Association 4400 Fifth Ave., Pittsburgh 13, Pa. HENRY F. SMYTH, Jr., Executive Secy. **April 23-26, 1951, Atlantic City.**

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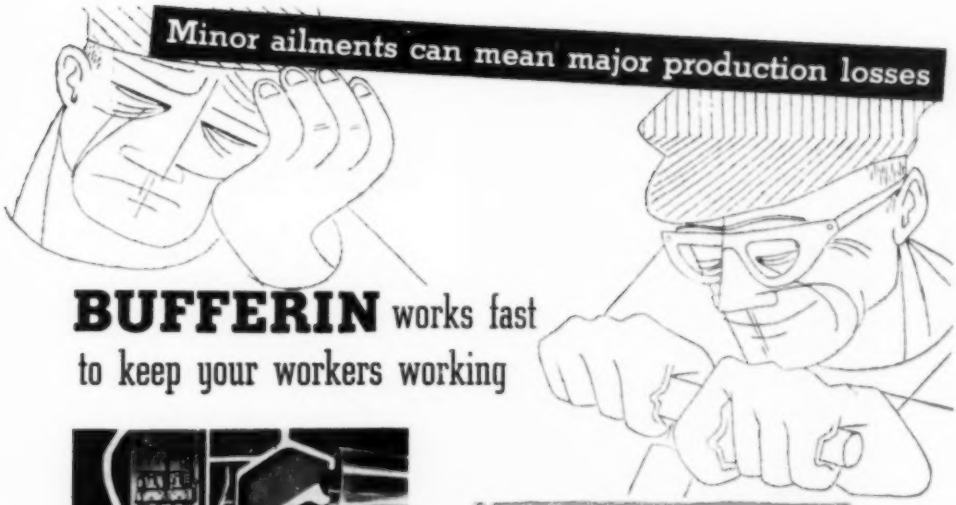

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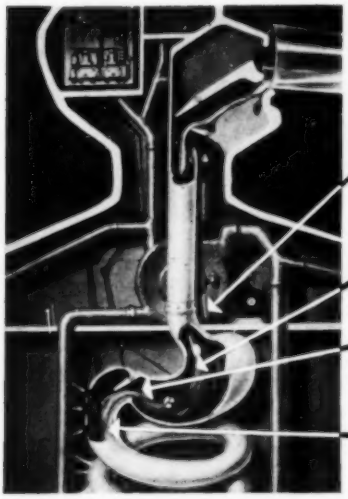

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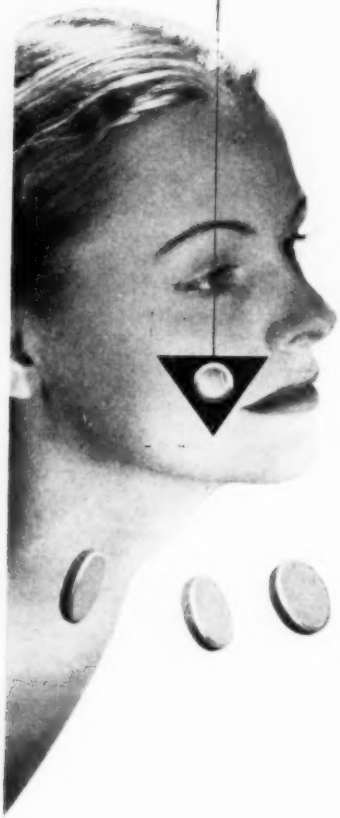

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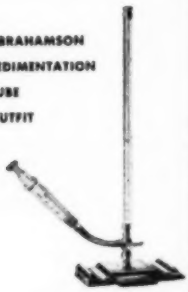

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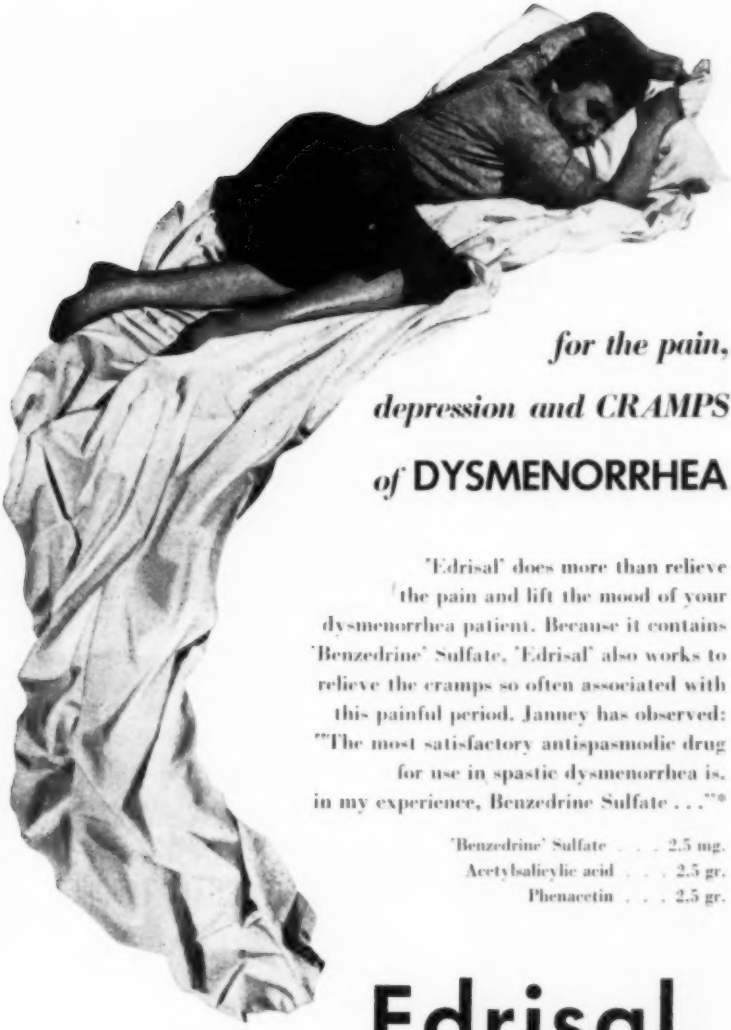

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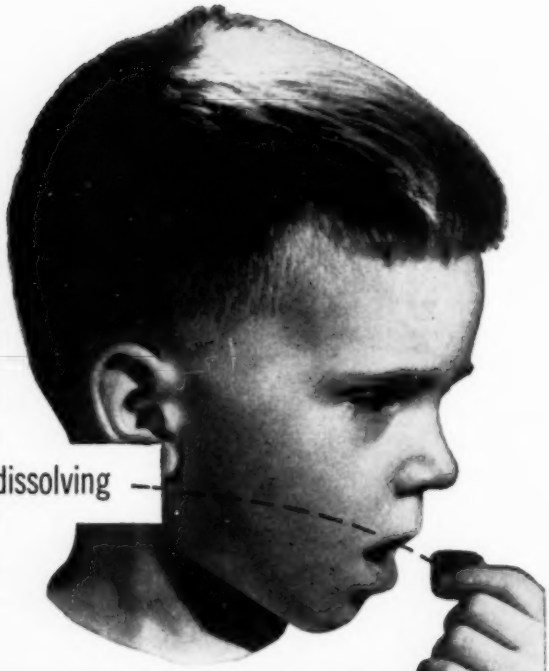
*Janney, J.C.: Medical Gynecology, ed. 2, Philadelphia, W.B. Saunders, 1950, p. 365.



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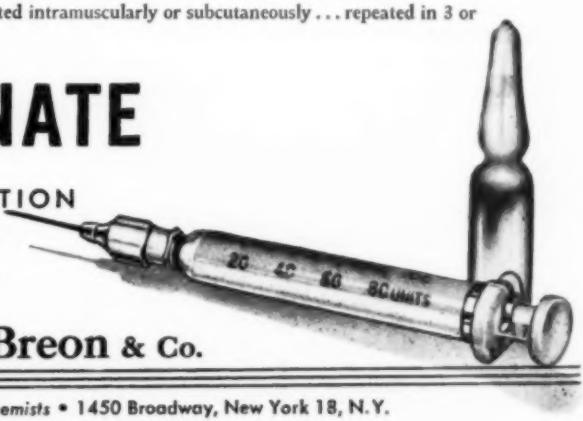

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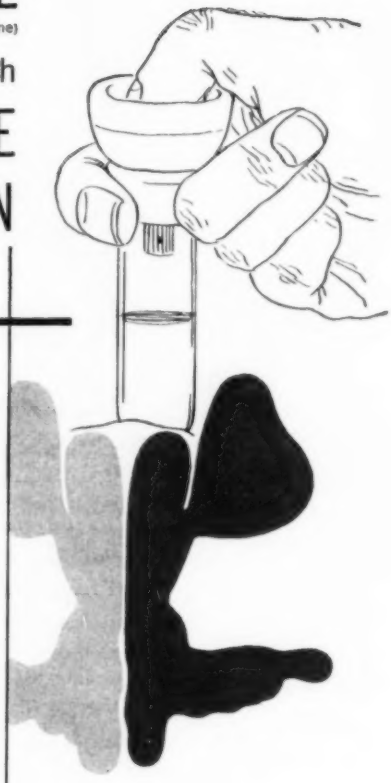

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INDUSTRIAL MEDICINE AND SURGERY
The Journal of Medicine in Industry
With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery"

Volume 20 JANUARY 1951 *Number 1*

Some Public Health Aspects of an Atomic Explosion

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WHEN one thinks of public health in its broadest sense, there are many aspects of an atomic explosion which merit consideration. As you know from the many different newspaper stories, the chaos and confusion at Hiroshima and Nagasaki after the two air bursts of the atomic bomb were overwhelming. The people of the stricken city were able to do little for themselves in the way of relief, for the injured or for those otherwise in need of help. The streets were filled with rubble and debris. The multitudinous fires raged uncontrolled: first, because persons even partially trained in fire fighting were not available in sufficient numbers; and, second, because the water supply was disrupted by breaks in the mains (and even if they had not been damaged the water supply would not have been adequate). The electric power lines were down at so many points that immediate repair was impossible. Street and rail transportation was almost totally disrupted and could not be repaired because of the death or injury of the personnel who could repair or operate the streetcars or trains.

In applying the lessons of Hiroshima and Nagasaki to comparable situations in the United States, one may predict that the major help for a bombed area will have to come from organized disaster relief groups from regions at least two or three miles from the detonation center. The police and fire services from the nearby communities, together with trained volunteer groups, will have to bear the brunt of the early rescue activities.

SINCE the pattern of disaster relief is fairly well established, except for the "saturation" type of catastrophe, one should, in general, concentrate attention on the newest facet of civil defense called most frequently "radiological defense."

The term, radiological defense, is generally used to describe the defensive measures that may be taken to meet the special problems due to the nuclear radiation associated with the atomic bomb.

In order for us to maintain the proper perspective in discussions concerning radiological defense, it should be pointed out that only 15% of the fatalities at Hiroshima and Nagasaki were due to hazardous nuclear radiation. The rest were due to direct and indirect blast effects, and to flash and flame thermal radiation effects.

If the potential hazards of surface or subsurface bursts are considered, one is forced to conclude that a much greater share of the total casualties and fatalities will be due to nuclear radiation. For this and other reasons, it is appropriate to discuss the major differences and possible defensive resources against all types of bomb bursts.

The hazardous radiation from an atomic bomb may be classified into four types: prompt, delayed, residual, and induced.

In the air burst, the delayed gamma radiation, due to the short-lived fission products in the raging ball of fire, is the most important. About 50% of the total radiation is emitted in the first second; the remainder in approximately one minute. The prompt gamma rays, emitted during the fission process itself, constitute only a small part of the total initial damaging radiation. The residual activity and the induced activity, that is, radioactivity produced by the neutrons from the bomb, contribute very little to the total hazard.

In the surface or sub-surface burst, whether underwater or underground, the residual and the induced radioactivity contribute practically all of whatever hazard may exist after the detonation. The prompt and the delayed gamma radiation are practically non-existent.

In thinking of radiological defense, it is interesting to note that, although the Laboratory with which I am associated at the present time is concerned primarily with the military aspects of

Lecture delivered at Basic Training Course for Physicians on the Medical Aspects of Atomic Warfare, at Birmingham, Alabama, May 5, 1950. Approved for presentation by the Navy Department, April 27, 1950.

radiological defense, the concepts, methods, and procedures which stem from its work are equally applicable to situations involving a civilian population simply because both cases involve human beings.

The field of radiological defense, which is only one part of atomic defense, which again is only one part of civil defense, may be categorized most easily by considering the defensive measures that may be undertaken before, during, and after a nuclear detonation. Stated in another way, one might say we should consider (1) the protective measures, (2) the prophylactic measures, (3) the possible evasive actions, (4) the evaluative procedures, (5) the reclamative measures, and (6) the therapeutic measures.

THE protective measures include both individual and collective protection. The simplest and most direct recommendation for individual protection is to wear loose-fitting light-colored clothing to cover as large a fraction of the body as possible. The reason for this recommendation is that the thermal radiation will be reflected and the ultra-violet radiation absorbed by relatively thin layers of light-colored clothing. The gamma and neutron radiation produced by the explosion will not be reduced in intensity sufficiently, for practical consideration, by any form of clothing used as shielding, which can be worn by a freely-moving individual. At Hiroshima it was observed that persons wearing dark-colored clothing suffered more serious burns than those wearing light-colored clothing. Also, the possibility of flash ignition of a fabric is less with light-colored clothing because less energy is absorbed in the material in a given time. This recommendation is based on the assumption that persons might be caught in the open at the time of an attack.

In the event that the populace may be warned of an impending air attack by means of a radar detection network, then a different set of recommendations is applicable. It accounts for not only protection against radiation, but also measures which may reduce fire and other damage. Accordingly, if such warning can be given, it is recommended that persons turn off the water, gas, and electricity at the place these facilities enter the building. They should then go to the basement and sit next to the wall under the strongest beam supporting the structure. Such action will afford maximum radiation and blast damage protection. Turning off the water will reduce the loss of water pressure caused by disruption of water mains, and turning off the gas and electricity will reduce the possibility of fires from these sources.

Another facet of individual protection is the possibility that partial body shielding may reduce a considerable part of the radiation damage, and hence radiation sickness. Although experiments with small animals indicate that the radiation sickness effects may be reduced by more than a factor of two, one cannot arbitrarily extrapolate such results to human beings. However, the possibility exists that persons may be protected against the relatively large quantities of low energy radiation accompanying the burst by as little as one-eighth inch of lead. The particular areas of concern are the abdominal region and the head.

It must be recognized that the above recommendations apply specifically to an air burst, where blast and thermal effects are maximized. For a surface or sub-surface detonation, these recommendations are applicable as far as protection against contamination is concerned. Under certain conditions it is probable that individual respirators, of the Army or Navy assault mask type, will be required to prevent inhalation of radioactive particulates as aerosols.

Collective protection, intended for large numbers of people as a group, can be provided in the event of an atomic attack if the civil functions to be protected are considered to be important enough. In the case of an air burst, such protection might be provided by building thick-walled concrete structures or by constructing extensive underground structures. Both of these practices are extremely expensive, and it is doubtful that any civil groups will endorse this concept. Even if they do endorse it, they will in all probability not be able to implement this policy because of its costliness for a relatively small gain. The more important observation concerning collective protection is that, rather than to design thick-walled concrete structures or underground installations, one should make use of the fact that a considerable amount of protection is afforded near the center of the ground floor of a multi-storied, many roomed, reinforced concrete structure.

The other facet of collective protection is the provision of adequate ventilation, in the case of an underwater burst, for ocean-front cities or for those near large, deep bodies of water which could be utilized in producing a form of radiological warfare. Ventilation would be important also in the case of a surface or underground burst, which would produce tremendous clouds of radioactive dust. In this latter case, the range of the blast effects would be much less than that of the air burst, and the chief concern would be with the provision of adequate ventilation in structures intended for groups of civilians.

In consideration of the uncertainties as to both the time and place of an atomic attack it is almost inconceivable that any but the most vital functions and facilities of a city or civil population could be adequately protected by any of the elaborate structures mentioned above. Thus, it seems unnecessary to dwell at length on the protective measures required for civil defense.

THE prophylactic measures available to public health officials, who must concern themselves

with this facet of radiological defense, are almost nil. Although it is known experimentally that intravenous administration of the important amino acid cysteine in a properly buffered isotonic solution immediately before radiation exposure will exert protective action, it is not a procedure that is adaptable to the handling of people en masse. Also, it is known that animals in a state of low oxygen tension are less affected by radiation than are those in a normal atmosphere. The only conceivable but doubtful recommendation from these latter experiments, if they are shown someday to be valid with human beings, might be to instruct civilians to hold their breath as long as possible after seeing the brilliant flash of light, which is so characteristic of the air burst.

ONE is restricted in thinking about evasive actions during an atomic attack by the rapidity of the casualty-producing phenomena. However, the recommendation can be made that a person should fall prone on the ground the instant he sees a brilliant flash of light. This action will reduce the chances of being hit by flying debris, and also offers the opportunity of lessening the radiation casualty effects by as much as a factor of two. The reduction of the radiation damage by this factor of two would be possible only in the event that a relatively thick, dense material lay between the bomb burst, which would appear as a low sun on the horizon, and the prospective casualty. The time rate of delivery of thermal and ultra-violet radiation is such that it is difficult to prescribe a practical evasive action. There will no doubt be chance circumstances in which a person may instantly step behind some light-opaque wall or partition possibly to reduce the thermal effects. Since the major fraction of the thermal energy is delivered in less than half a second, generally applicable evasive actions cannot be prescribed categorically.

THE evaluative measures of radiological defense are twofold. First, one must determine what hazards exist after the detonation, and, second, there must be reasonable procedures by which medical practitioners can receive information concerning the radiation dosage persons received at the time of the detonation. Although we hear much about instruments which are to be produced for radiologic monitoring in the event of an atomic attack, I am not sure from what I read that there is a clear picture in the minds of those planning to use the instruments as to when they will be required. Too often, the radioactive contamination resulting from an underwater or underground burst is confused with the general phenomenology of the air burst, with the result that too many people think in terms of the serious radiation hazards they will face when they think of an atomic burst per se, without considering the type of burst. At Hiroshima and Nagasaki, radiation surveys of the ground showed that the maximum activity a half day after the blast was only a few milliroentgens per hour. Stated in another way, this means that the contamination levels were generally so low that there was no radiation damage to any persons entering the area afterwards, since the "tolerance" dose of 0.3 r per week was not exceeded. Stated even more emphatically, this means there were no cases of damage to human beings from *residual* radioactivity at either Hiroshima or Nagasaki.

These low levels of ground contamination were due to the fact that the "ball of fire" did not touch the earth, and that the rapidly rising column of superheated air carried over 99.9% of the fission products and undetonated fission material into the stratosphere.

The instruments required for radiological defense should be confined to those required for measuring beta and gamma radiation. It can be demonstrated that for a period of up to 100 days after a normal bomb detonation there will be no alpha radiation hazard if one cannot detect hazardous amounts of beta and gamma radiation. What it means is that alpha radiation may be monitored by means of beta-gamma radiation measurements during the first three months.

The public health official, in this facet of his work to organize and train atomic warfare disaster groups, will have to worry about the instruments he receives, the conditions under which they are to be used, and the interpretation of the readings which are taken. Of concern, also, will be the cost of each instrument, its reliability, durability, and ease of use by relatively unskilled monitors.

One suggestion which merits consideration by public health and civic officials is that the members of fire departments be trained in the use of radiation monitoring instruments. This practice will result in an efficient use of highly trained and organized groups of personnel; for, in the case of an air burst, where the fire hazards are the greatest, there is no need for radiological monitoring, but with an underground or underwater burst there will be fewer fire hazards and many radiological hazards. These fire fighters can be indoctrinated in the use of radiological monitoring instruments during normal working hours, and at times they are free from fire-fighting duties. This training program should be extended, also, to the fire-fighter reserves to form a secondary line of defense in catastrophic situations where fire takes a heavy toll.

We may summarize the foregoing discussion by saying that radiation instrumentation will be important only for those catastrophic situations involving underwater or underground bursts.

The problem of monitoring radiation hazards in the clean-up operations after an atomic bomb burst is exceeded only by the problem of determining the nature of the injuries and segregation of the casualties as far as potential mortality is concerned.

To get some idea of the nature of the problem, let us assume that an air burst exhibits damaging effects to a distance of 4000 yards from the zero point in all directions. If we assume a homogeneous civil population distribution in this $16\frac{1}{4}$ square-mile area, we may calculate that 6.1% of the total potential casualties will lie within the circle of 1000 yards radius, $18\frac{1}{2}$% in the 1000 to 2000 yard annulus, 31% in the 2000 to 3000 yard annulus, and 43.7% in the 3000 to 4000 yard annulus.

We see at the outset that in the annulus from 2000 to 4000 yards, where the thermal radiation damage is the principal casualty producer, 75% of the potential casualties are located. The remaining 25% of the potential casualties lie in the circle of the 2000 yards radius, where the radiation and indirect blast damage, as well as thermal damage, becomes quite important.

To get a complete picture concerning the area where one may expect casualties, one should consider also the rate of fall-off with distance of the casualty-producing phenomena. Curiously enough, the product of the population distribution and the casualty curves is such as to indicate that the largest number of heavily damaged casualties, i.e., showing potential mortality, lies in a region about 1200 yards from the ground zero point.

As one approaches a bomb-burst area from the outside, one will find that the largest number of casualties in the 3000 to 4000 yards radius generally will be due to thermal radiation, and there will be little concern for gamma and neutron irradiation effects. As one approaches closer to the center of the detonation area, the nature and causes of the casualties will become more complicated, and gross examination may not reveal the actual underlying cause. When one must expect a mixture of effects, an increasing difficulty in diagnosis is encountered. To the medical practitioner, the difference between the blast and thermal effects will be obvious. However, to gauge the extent of gamma radiation damage, one will need auxiliary information. If a personnel dosimeter were worn at the time of the catastrophe, one has available information upon which subsequent diagnosis and prognosis can be based. In lieu of personnel dosimeter measurements, it will be necessary to have clinical data concerning radiation exposure. There are, at the present time, a considerable number of investigations under way to determine if clinical procedures for field operations can be employed for determining radiation damage to persons exposed during an atomic attack. The results thus far are interesting, but not definitive as far as practicability is concerned.

Although much experimental work has been done with film badges as personnel dosimeters, they are not satisfactory for field or emergency use for they require developing facilities, and a relatively long time is necessary to obtain results. There are two types of direct-reading, pencil-type dosimeters, but these are expensive, and it is not logical to assume that, even if an entire population were equipped with such devices, the people would wear them regularly. If a fraction of the total population wore their dosimeters, it would be possible to obtain enough information to plot isodose contour lines. However, this procedure would not be satisfactory for operational civil defense use because of the time required for collecting and collating the information into usable form. Generally, then, public health officials will have to rely upon well-trained medical practitioners and their aides for a sensible evaluation of the types of casualties which they will see. No instruments, as presently conceived, are being developed, for those persons charged with the responsibility for implementing effective radiologic defense measures, which will answer all problems of radiation measurement.

THE term reclamation is generally employed to describe the methods and procedures that are used to restore materials, equipment, areas, or structures to a usable or operable condition after an atomic explosion. This includes the restoration of services, such as electricity, gas, and water, and communications, such as telephone and surface travel. It includes, also, the measures which must be taken to minimize the often neglected hazards due to industrial operations.

Because we are concentrating our attention on radiological defense, I shall devote my discussion to the reclamation measures most accurately described as decontamination, which involve the removal of radioactivity from equipment, areas, or structures. Decontamination measures should be undertaken only when there is a reasonable chance to minimize the radiation hazards to personnel. They have no meaning otherwise.

In the case of an air burst I shall repeat that there is *no contamination of significance*. Only in those cases where the bomb burst is close enough to the ground for the ball of fire from the bomb explosion to come into contact with land or water masses will there be significant contamination hazards. The one improbable exception is the "fall-out" from an air burst. I say "improbable," because the chance that radioactive rain will fall in a particular downwind location from the zero point is extremely small. The only other case of serious concern would be that of an atomic detonation during a rain storm in which the rain clouds are many thousands of feet above the earth.

When an underwater explosion is produced in such manner that the radioactive spray and mist drift across a city, the problem for the public health official becomes much more difficult. The widespread contamination of buildings, streets, and homes by the radioactive water, whether from fall-out, spray, or "base surge," may lead to radiation fields of such intensity that entry of persons without serious damage

would not be possible. Because of the costliness of decontamination operations for widespread contamination, it is recommended that time be used as the decontaminant. By this I mean that the bomb-produced radioactivity decays at such a rate that a short-time wait, if permissible, is more efficient than an elaborate and hazardous decontamination operation. A rough rule of thumb for gauging the decrease of intensity with time is given as follows: if one has a given level of radiation at one minute after the burst, then 12 minutes later the activity will be only 10% of that initially; two hours after the detonation only 1% of the original radioactivity will remain; 17 hours after the zero time, only one one-thousandth of the initial activity will be left; and four and one-half days afterward, the radiation level will be only one ten-thousandth of its original value.

The key to most of the civil defense problems in radiological decontamination may be found in the expression: evacuate and wait. Whereas the military forces many times may have to perform operational decontamination for tactical reasons, *such action is not warranted for public health problems except under unusual circumstances.* The cost of such operations in time and manpower is too great.

A word might be said at this time concerning the reclamation of foods, and the potability of water supplies. Fresh or unpackaged foods cannot be reclaimed if they are contaminated. However, it should be possible to use foods which are enclosed in airtight and watertight containers. The most obvious example to give is canned goods. Any contamination on the cans, which cannot be removed by simple spray washing, will not affect the edibility of the contents of the cans. Some caution should be exercised, however, in examining undamaged cans or packaged foods which were at a distance of 500 yards or less from the zero point of the air burst. This concern is felt because of the possibility of induced radioactivity in the food itself. Generally, the radio-isotopes which could be produced under these conditions would all be short-lived. The problem of induced activity in such foods is of no concern with either the underwater or underground bursts.

As far as contamination of water supplies is concerned, one may say that, except under most unusual conditions, there is no real problem. Most urban water supplies are drawn from reservoirs located usually some distance from the center of the city. In the case of the air burst there is practically no contamination; hence, the real problem will be the provision of adequate supplies of water. Disrupted water mains and piping will create more problems concerning the potability of the water than any radioactive contamination.

In the case of the underwater or underground burst, one may draw similar conclusions. Undersea bursts are of little concern since the water supplies of any city nearby are not drawn from the sea. Also, it would be almost impossible to contaminate any appreciable amount of water in reservoirs or wells (infrequently found) in such a city. In the case of contamination of bodies of fresh water, such as Lake Michigan at Chicago, which does use Lake Michigan water, the problem is again of minor importance because in almost all cases such water is run through elaborate purification plants before being used for drinking purposes. In the case of the underground bursts, the problem of the leaching of contaminated ground by rainfall with subsequent contamination of underground water supplies is present but relatively unimportant because the porous earth is an excellent adsorbent for fission product activity.

THE therapeutic measures, which are a part of radiological defense, are comprehensive in number and type. Perhaps this fact in itself indicates the magnitude of the problem which is involved when one must deal with the casualties due to direct or indirect blast effects, thermal radiation effects, and neutron and gamma radiation effects.

Since so much time has been devoted in this course to these medical aspects, I shall dismiss them summarily with the remark that the medical practices followed in the catastrophe resulting from an atomic bomb explosion will be no better than the training given to public health officials, who must organize the operating units of medical practitioners and their assistants, and the training given to the medical practitioners, who must treat the casualties.

One subject of great importance is that concerning the operational phases, since it will be impossible for the available physicians to administer to the many thousands of casualties in their midst without a well organized plan

One concept for atomic disaster operations envisions the establishment of operational field stations at control points on the major roads leading into the damaged city or area. These control centers will be set up at the closest possible safe distance from the epicenter. The perimeter around the disaster area outlined by these stations might be called the "rescue perimeter." Another line of defense within this area might be the "fire defense perimeter," beyond which every effort is exerted to contain the conflagration. This type of control will be necessary because there will not be, even under ideal conditions, enough water available to fight *all* fires.

During the first half hour, before the conflagration has developed in full, it will be possible to send in "guide rescue" teams to escort or carry the dazed or injured to the rescue perimeter control stations. *Here the physician takes over.*

If the guide rescue team has done its job well the casualty will be tagged in such manner that his location at the time of the blast will be

known. (e.g.: if he is not burned then it means he was shielded—but how, and how much?)

No attempt should be made to extricate persons by using equipment or many men within the fire defense perimeter. To do so, would deny possible rescue of many more persons. Time and manpower are at a premium.

Summary

IN SUMMARY, we may say that the primary problem of concern to the public health officials at the present time is that of education. Education to eradicate the fear engendered by the apostles of doom during the past four and a half years—education to teach responsible persons to be able to sort the wheat from the chaff in atomic bomb phenomenology so that the existing confusion is dispelled.

Second, well defined operational plans must be implemented to make the best use of the available physicians and their corps of assistants. Also, studies must be made of the various other facets of public health relief, such as inadequate supplies of potable water and food, the bacteriologic problems, and the toxicologic problems, which are secondary to the immediate effects, but nevertheless potential destroyers of life.

Third, there must be more training courses, such as this one, to give all physicians who might be called upon, sound, practical, down-to-earth information, which will enable them to handle the casualties with more than a smattering of ignorance concerning radiation damage effects.

The problems are many, but they are not insurmountable.

The Industrial Hygiene Program

INDUSTRIAL HYGIENE'S key mission is to protect plant employees and reduce occupational disease to the point of rarity. The effectiveness of an industrial hygiene department depends almost entirely on management policy. "The industrial hygiene department should have ready access to some policy-forming executives on the managerial staff as well as to all plant managers, plant engineers, personnel directors, physicians, and safety engineers. Some of the more obvious benefits of an industrial hygiene program are as follows: (1) It provides facts about plant environment and recommendations which, if followed, will prevent occupational diseases or at least reduce them to a minimum. (2) It saves a substantial amount of money that otherwise would be spent as compensation for occupational diseases. (3) It builds goodwill among employees and in a community by making the working environment safe and preventing pollution of the air around an industrial plant. (4) It demonstrates a company's personal interest in the health and welfare of the employees and improves personnel relations when the employees find management willing to investigate and study complaints. (5) It gives facts to key personnel for educating employees in safe work methods on both routine and special production processes. (6) It offers opportunities in development of new industrial processes for study of pilot plant operations, so that control and safe working procedures can be introduced when a new process goes into full production. (7) It gives industry with its own hygiene service a chance to plan and coordinate its production and hygiene programs without depending on outside sources for help. Outside sources, such as consultants and official agencies, are sometimes understaffed and overworked. (8) It can serve as a clinical diagnostic aid for plant physicians through results of its environment studies and analyses of biological specimens. A survey of industrial hygiene costs reveals that they varied from less than 50 cents to $2.50 per employee per year. These figures represent a modest sum when compared to medical costs of $6 to $30 and safety costs of $4.50 to $66 per employee per year in the group of industries surveyed."

—FRANK A. PATTY, Director, General Motors Research Laboratories, addressing the American Public Health Association's Industrial Hygiene Section, St. Louis, October 31, 1950.

Radiation Hazards in the Atomic Energy Program

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SINCE 1942 when intense effort on the development of atomic energy began, the atomic industry has completed almost one million man years of work. During this eight-year period this new industry has operated with an accident rate of 6.3 for every 100,000 man hours worked. In 1949, our best year thus far, our accident frequency was 4.60 comparable with the record of 4.56 for the aircraft manufacturing industry. By way of comparison we might also cite the food industry's record of 18.1, the textile industry's record of 8.79, and the average of *all* industry, 11.49.

The atomic energy industry must contend with all of the usual industrial hazards, such as those encountered in the vast construction projects and in the operation of chemical processing plants. Unlike other industries, however, we have the additional task of safeguarding our personnel, and the public, against the potential hazards arising out of the use of radioactive materials.

Despite the large-scale processing of radioactive substances, the injuries produced by the radiological hazards have been few. During the past seven years, there have been but two deaths and seven injuries attributable to radiation exposure. The two fatalities occurred in similar but separate accidents involving scientists who were performing experiments in bomb physics. In these accidents two other individuals suffered injuries from which they have recovered.

At Eniwetok, four individuals performing tasks subsequent to the 1948 tests of atomic weapons received radiation burns to their hands. One other radiation burn to the hands has been reported elsewhere.

The atomic energy program is symbolized in the public mind by perhaps a half dozen great centers of the industry like Oak Ridge and Hanford, but to see it in its totality, one also includes the uranium prospectors of Colorado and Utah, the many hundreds of universities, hospitals, and industrial laboratories taking advantage of the abundant supply of isotopes, a network of chemical plants processing raw materials and the scores of industrial and university laboratories where research is directed at more effective and efficient utilization of atomic energy.

Man's utilization of the ionizing radiations, however, did not begin in 1942. The discovery of atomic fission in 1939 was the basis for the peacetime and military applications which have since been developed on a scale incomparably greater than was true formerly, but during the first 40 years of this century the medical and industrial use of x-rays and radium became rather commonplace. We entered World War II with a considerable experience with these radiations, and the knowledge gained from this experience provided the basis for the protective procedures established for project personnel.

After eight years of experience and intensive medical research, how much further along are we in our understanding of the problem of protection against radiation injury? How much radiation can a person safely receive? What progress has been made in the field of personnel monitoring, in radiation instrumentation, and in the disposal of radioactive wastes?

Biological Effects

RESEARCH in the field of biological effects of the ionizing radiations has been conducted on a wide scale as a fundamental part of our atomic energy program. When this research began intensively in 1943, considerable information had already been accumulated. The effects of ionizing radiations on the blood-forming and reproductive tissues were understood qualitatively within a few years after the discovery of x-rays. By the 20's it was known that cancer could be produced by radiations. This knowledge came largely from the early scientists and industrial workers who were injured because they did not suspect that damaging biological effects could be produced, and took no precautions when working with x-rays and radium. The genetic effects of ionizing radiations were first observed 23 years ago in experiments with fruit flies.

Thus, by 1930, the major biological effects were known qualitatively and some quantitative information had also been gathered. Maximum permissible daily exposures to external radiation were proposed by authoritative groups in this country and abroad, and the amount of radium deposited in the bones that would cause injury was known. This information was of valuable assistance in preparing to safeguard the thousands of new workers who were to be exposed to radiations but a great deal of new research was required and much has been accomplished during the past few years.

The injurious effects which were first observed among the early scientists, the physicians, and the radium dial workers are being studied in laboratory animals in dozens of research institutions, as are the mechanism by which these effects are produced and their relationship to amounts of radiation received. Out of these studies is emerging a vast and useful literature dealing with the biological effects of the ionizing radiations.

Presented at 20th Annual Safety Convention and Exposition, Hotel Statler, New York, March 29, 1950.

The ability of the ionizing radiations to produce genetic changes has been the subject of much study and speculation. The experimental evidence up to now supports the view that the levels of radiation which are and have been permissible are not significant so far as genetic changes in humans are concerned. Were this not so, the principal hazard would be not to radiation workers but to the well cared-for persons who receive occasional x-radiation for diagnostic or therapeutic purposes. A person who receives annual chest and dental x-ray examination will in many cases be subjected to more radiation than most of the people employed in the atomic energy program.

The genetic effects and carcinogenic actions of the ionizing radiations are believed by many to be non-threshold in character. This means that as the radiation dose is reduced, the *possibility* of producing cancer or genetic changes continues to exist, though the *probability* of such occurrence diminishes rapidly. Those who hold to this theory point out that in the normal, unexposed population the occurrence of spontaneous mutations and the incidence of certain types of cancer may be partially referable to natural radioactivity to which we and our ancestors have always been exposed. If this is so, a person is subject to a possible but highly improbable additional risk just as soon as he receives radiation in addition to background exposures from cosmic rays and radioactive constituents of the earth's crust. However, the radiation levels which are now permissible are so low that although these specific effects are "non-threshold," the additional risk to the person could not be measured because it would be obscured by already existing causes of cancer and mutations.

Permissible Radiation Levels

FOR several years prior to the inception of the atomic energy program, radiologists recommended 0.1 roentgen as the maximum permissible daily exposure to x- or gamma radiation. This fundamental yardstick for evaluating radiation hazards was based upon many years of experience with hospital x-rays. Although our experience of the past eight years provides no epidemiological reason to believe this value is too high, the past year has been marked by a downward revision of this figure to 0.05 roentgen per day or 0.3 roentgen per week. It is important to emphasize the fact that no injuries have been reported at the higher level. This downward revision is in a large measure simply a recognition of the fact that we are now working with more penetrating radiations than those involved in the early x-ray experience upon which the original figure was based. It should be noted that the two deaths and seven injuries referred to earlier were in all cases the results of accidents involving acute exposure to very high levels. There have been no cases of radiation injury due to chronic over-exposure, at 0.1 r. per day.

In many places, safe operation of the atomic energy program requires that radioactive contamination of air and water be maintained at sufficiently low levels to avoid injury to the employees and to the public. More time must elapse before we can accept with confidence the many maximum permissible concentrations which must be established for the fission products and some of the radioisotopes. Because insufficient information is available to us, most of the criteria now in use are very conservative.

At same installations, the maximum permissible levels of radioactivity that may be released to the sewers, streams, or ground are so low that disposal of ordinary kitchen refuse by these means would be in violation of the laboratory safety rules. (All potassium contains a small percentage of a radioactive isotope. Most foods contain potassium and are measurably radioactive.)

Protection Against Radiation

PROTECTION of personnel against potential hazards associated with the use of radioactive materials requires varying degrees of alteration to the normal physical design of the work place. At one extreme, we are faced with complex problems like those associated with operation of a chain reacting pile, or the processing of materials which have been subjected to irradiation within the pile. These operations are conducted by remote control from behind thick concrete or lead shields. On the other hand, the laboratory using trace amounts of short-lived isotopes can do so in a manner not markedly different from ordinary practice. Between these extremes are all shades of potential hazards requiring varying degrees of departure from normal industrial and laboratory procedures.

With the knowledge that has been accumulated since the inception of the atomic energy program, all types of procedures involving the use of radioactive materials can be and are being conducted safely.

In the great centers of atomic energy industry, such as Hanford and Oak Ridge, enormous amounts of radioactive materials are processed. Safe operation frequently requires that the work be performed by remote control. Anyone with experience in chemical plant operation can appreciate the problems presented by the need to control a complex process behind many feet of concrete. The control instrumentation and the mechanical features of the automatic procedures are of types which in many cases did not exist prior to the Manhattan Project. They were brought into being only because of the extent to which process mechanization is required in order to conduct the program safely. In these plants we find the technology of radiation protection at its most complex state of development.

Fortunately, the thick shields, the periscopes, the highly intricate and expensive control in-

struments, and the unusual degree of mechanization are not inherently a part of all work with radioactive material. Were this not true, the economic burden imposed by the need for such features of plant design would place these highly useful tools of research and industry beyond the reach of most private institutions.

The scientist or technician in a laboratory using millicurie amounts of radio phosphorus can work safely with equipment and procedures that are little different from the biological or chemical techniques with which he is accustomed in non-tracer work. The ordinary laboratory can be made ready for work with P^{32} with a few lucite shields, a conventional laboratory hood and perhaps $1000 worth of counting equipment. The technician should take little more than the usual care to avoid spills, and he will exercise a few simple precautions to avoid over-exposure to his hands.

If we next consider the *average* laboratory working with radioiodine, a gamma emitter, we begin to see, in elementary form, the more advanced procedures required for radiation protection. The radioiodine will be stored in a shielded safe or "cave" from which the technicians will remove the isotope using forceps in order to keep their hands distant from the source of radiation. Chemical manipulations may be conducted behind a lead shield, with the technician depending upon a mirror for visibility. If the procedure is a complex one, or if the amounts of radioiodine relatively large, there may be a "cold run" in which the manipulations are rehearsed and simplified.

The uses of radioisotopes in laboratories of the above types are not isolated examples. The majority of shipments of isotopes from the Atomic Energy Commission to private industry involve millicurie amounts of short lived materials. From August 2, 1946, the date of the AEC's first isotope shipment until December 31, 1949, almost 9,000 shipments of radioisotopes were supplied to users in this country and abroad. Seventy-two per cent of these shipments involved iodine 131, phosphorus 32 and sodium 24. These are short-lived isotopes in which the potential hazards are minimal.

If a laboratory is to use radioisotopes such as strontium 90, personnel protection may become a major consideration in the laboratory design. The radiations from this beta-emitting isotope involve only minor problems in protection against external radiation, but the relatively long life of the isotope and the fact that it is characteristically a bone seeker makes it necessary to guard against ingestion and inhalation.

The kind of controls selected in any given instance depends essentially on the type and amount of radioactive material being handled. With proper design the personnel exposures will be well under the recommended permissible doses. The design of protective features should be no more elaborate than is necessary to maintain the weekly dose comfortably below the maximum permissible exposure. There is no virtue in designs which provide unreasonably large safety factors obtainable only at great expense.

Methods of Waste Disposal

THE disposal of radioactive wastes remains a perplexing problem. We know how to dispose of the wastes safely, but this is being accomplished at a tremendous cost and a great deal of effort is being directed towards developing more economic methods.

The more perplexing radioactive wastes include reactor cooling air, reactor cooling water, and residue liquids and solids from the separation of reactor-irradiated materials.

In an air-cooled reactor, the problem is simplified by filtering dust from the air prior to its entry to the reactor. Normal air-borne dust otherwise would become radioactive in passing through the neutron flux of the pile. However, the argon contained in normal air does become active, and radio-argon is the principal radioactive constituent of the pile effluent air. Fortunately this isotope has a half life of only two hours and therefore decays rapidly. Then too, it is greatly diluted in the atmosphere. In areas where air cooled reactors are operated by the Commission, samples of air are collected continuously for some distance in the vicinity of the pile, and the radioactivity of the air is maintained at such a low level that the presence of radio-argon is practically indistinguishable from the presence of natural radioactive gases such as radon and thoron.

When a pile is water-cooled we have a somewhat similar situation. Certain of the elements present as impurities in the cooling water become radioactive by neutron irradiation in passing through the reactor. Again, the radioisotopes thus formed are relatively short lived and the water can be retained in holding tanks to permit decay of the radioactivity before it is released back into the streams or rivers.

Materials which have been irradiated purposely within a pile emerge highly radioactive. Removal of material from the reactor is usually followed by a chemical process in order to extract a desired isotope or element from the irradiated substance. The waste solutions and sludges from these processes are apt to be large in volume and highly radioactive. In most cases, the short-lived radioactive constituents will decay during a short period of retention, after which the wastes can be treated.

A number of laboratories have designed evaporation equipment which substantially reduces the volume of radioactive liquids. At one laboratory, it is expected that equipment now being constructed will enable a 98% reduction in volume. The low activity distillate could then be discharged from the laboratory by normal procedures.

Various chemical methods for concentrating the radioactive materials in low level liquid wastes are now under study. Ion exchange methods which have for so many years proved useful in water conditioning, also are being investigated. Some radioisotopes are markedly concentrated by certain micro-organisms and the possibility that this phenomenon can be utilized as a waste disposal technique is now under study.

Some of the more common short-lived isotopes can be disposed of by ordinary means, provided a few precautions are taken. The National Advisory Committee on Radiation Protection has agreed that limited amounts of P^{32}, I^{131}, and Na^{24} can be discharged into sanitary sewers. In order to guard against the possibility of biological concentration of the isotopes by micro-organisms in the sewers, the radioactive materials can be adulterated with larger amounts of stable isotopes of the same element.

Instrumentation and Personnel Monitoring

MANY advances have been made in the field of health physics instrumentation and personnel monitoring. Field survey instruments for limited application had been developed and were commercially available on a very limited basis prior to the last war, but during the past several years, tremendous strides have been made and survey instruments are now readily available in a variety of types. Prototypes of the present instruments were developed under the Manhattan District and they continue to be known by their original code names such as cutie-pie, zeuto, zeus, etc. Our instruments today are far more dependable than the wartime versions, and their size and weight have been substantially reduced. Instruments of a variety of types are now being manufactured by industry for sale to an increasing number of companies and institutions who are participating in the utilization of radioactive materials.

Film badges and various types of pocket ionization chambers are likewise available commercially for use in measuring the daily or weekly radiation dose to the individual worker.

A major new development has been the introduction of scintillation counting. It has long been known that irradiation of certain substances will produce pulses of visible light. The fluoroscope is an example of how this principle has been applied for many years. The development of synthetic phosphor crystals of high quality and the introduction of much improved photo-sensitive tubes now make it possible to construct counters utilizing this principle. These instruments are called scintillation counters and find a number of important uses in the radiation protection program. In particular, the counting of alpha-emitting dust has been greatly facilitated.

It is well known that radiations can produce certain chemical reactions. This principle is being utilized in the development of vials of solution in which color changes are induced by known radiation doses. Only a laboratory curiosity at the present time, this method of personnel monitoring is attractive for its inherent simplicity and holds considerable promise for the future.

Trend in Industrial Utilization of Atomic Energy

BEFORE closing, I should like to touch briefly on some current civilian applications of atomic energy, with particular emphasis on industrial applications.

By January, 1950, almost 9000 shipments of radioisotopes had been delivered to hospitals, laboratories, and industrial plants in this country. Forty-five per cent of these shipments were to hospitals, where the isotopes were used in the treatment of disease, and 47% were used in biological, chemical, and physical research. Only 326 shipments, approximately 3.5%, were used for industrial applications.

The great demand for isotopes in the fields of medicine and research will no doubt be paralleled by industry in the next few years, as personnel trained in the application of these new tools become more readily available. At the present time, the shortage of technicians in this field is a bottleneck which is preventing radioisotopes from being more widely used. The great potential utilization in industry can be visualized by reviewing a few of the present applications.

An example of highly ingenious application is to be found in engine manufacture. Many of you are familiar with the problems inherent in the testing of piston rings, where the engine ordinarily must be assembled and then disassembled in order to examine the rings being tested. One company greatly simplified this procedure by arranging to have the test rings made mildly radioactive by pile irradiation. The wear of these rings during engine testing could then be easily studied by sampling the oil at regular intervals. The rate at which the rings were being worn away could be determined accurately by the number of radioactive particles in the oil.

The thickness of paper, leather, and other sheet materials can now be determined conveniently by thickness gauges utilizing the absorption of beta particles from pile produced isotopes. Two companies are now manufacturing these "beta thickness gauges" for industrial use.

In the operation of pipe lines, it is common practice to pump several grades of oil, one grade behind the other. Location of the boundaries between two such batches was a troublesome problem, and oil was frequently wasted before the boundaries could be located and the individual batches diverted to the proper sections of the refinery. This problem has been solved by adding a small amount of radioactive material between the two grades of oil. Geiger counters situated at appropriate places beside the pipe line accurately locate the end of one batch and the beginning of another.

These are only a few of the ways in which products of the atomic energy program are being used in industry. The use of radioisotopes is becoming widespread. Industry, with the aid of its own experience accumulated for 40 years before World War II, and with the benefit of eight years of experience in the atomic energy projects, is working, and will continue to work, safely with these new and useful tools. As is true for all potentially dangerous industrial materials, industry must look to the specialists for help. The physicians, the safety engineers and the industrial hygienists will all assist, whether they be on the staff of the company using isotopes, or represent the insurance carrier, or the local, state or Federal agencies.

By participating in seminars and courses, such as the recent New York University Conference on Industrial and Safety Problems of Nuclear Technology, the training course for insurance company safety engineers held at Brookhaven National Laboratory, and the symposium in Washington, D.C., for State Sanitary Engineers, the Atomic Energy Commission is endeavoring to assist industry and other interested agencies in learning the techniques of safe isotope use.

New Institute of Industrial Health at Ann Arbor

GENERAL MOTORS on December 10, 1950, announced a $1,500,000 research project to promote better health for its 446,000 employees, as well as the men and women of all American industry. It joined hands with the University of Michigan in establishing The Institute of Industrial Health at Ann Arbor. The broad objectives will be research, education and service in industrial medicine, health and safety. The long-range research project will be administered by a board to be appointed by University of Michigan Regents. C. E. WILSON, President of General Motors, said, in making the announcement: "We believe the establishment of the Institute of Industrial Health will implement, perpetuate and expand our already-comprehensive employee health maintenance program and the pioneering research activities in which our medical departments have engaged." Findings of the Institute in its wide range of research activities, including the prevention, diagnosis and treatment of occupational diseases will be made available to all companies and all employees. General Motors maintains 106 medical departments in as many operating units and employs 125 physicians and 675 nurses, technicians and other medical personnel—a total staff of 800—to carry out the objectives of its over-all health maintenance program. This medical program is based upon recognition of the fact that maintenance of the highest possible health standards of its employees represents a constructive approach to sound personnel policies. The program has proved to be economically sound, judged by the health conservation reflected in lessened sick absenteeism, less labor turnover, and increased employee morale. It also has raised substantially the health standards in the communities in which G. M. employees work and live. MR. WILSON also said: "Establishment of the Institute at Ann Arbor will enable us to investigate many facets of industrial health that urgently need exploration and should contribute importantly to enhancing the health of the more than 39,000,000 men and women in American industry."

OF THE $1,500,000 granted the University for the Institute of Industrial Health, a total of $500,000 will be used as needed for equipment. In addition, an annual payment of $100,000 for 10 years will be made by GM for research and to meet the expenses of fellowships, scholarships, added faculty and other personnel, a clinic, and publications and refresher courses for doctors, nurses, and personnel in auxiliary services. The Institute will begin operations in the near future. It will be under the supervision and control of a Board of Governors to be appointed by the University's Board of Regents. General Motors will be represented on the Board but, in the words of DR. MAX B. BURNELL, General Motors Medical Director, "this is to be the University of Michigan Institute of Industrial Health, *not* the General Motors Institute." DR. BURNELL also affirms that the establishment of this Institute does not conflict in any way with the General Motors in-plant program for physicians who wish to enter the field of industrial medicine. This program will continue, as in the past, under the direction of the General Motors Medical Directors.

THIS Michigan plan for education in industrial medicine and allied subjects, provides an unique, commendable feature. In other institutions over the country engaged in instruction at higher levels, activities are essentially associated with either medical colleges or schools of public health. In the Michigan plan, the Medical School and the School of Public Health are somewhat equally provided funds. Thus clinical and preventive medicine respectively benefit in rightful proportions.

In the discussions with executives and officers of General Motors that eventually led to the magnificent grant of $1,500,000, the needs and opportunities in the field of occupational medicine chiefly were presented through the long experience of a group of physicians and public health luminaries to whom outstanding acclaim is due. The group includes DR. A. C. FURSTENBERG, Dean of the Medical School of the University of Michigan, DR. HENRY F. VAUGHAN, Dean of the School of Public Health, DR. CLARENCE D. SELBY, Resident Lecturer in Industrial Health, and DR. MAX B. BURNELL, Medical Director of General Motors.

Long the charge has been made that the specialty of industrial medicine is a backward one because of lack of training facilities, both on the graduate level and as an essential portion of undergraduate training. The merits of this charge in part have been warranted until the recent past. Now with the outstanding opportunities afforded through this gift by General Motors to the University of Michigan and because of recent similar developments in other universities, any claim that educational opportunities in industrial medicine are non-existent is clearly dissipated.

Herniated Intervertebral Disks

— A Time and Cost Analysis of 100 Cases —

REX H. WILSON, M.D.
Akron, Ohio

THE "industrial back" is a major problem for the physician in industry. All industries, large and small, have a number of employees who complain of "bad backs." The range of severity varies from the employee who occasionally misses a few days work to the one who claims total permanent incapacity, with concomitant demands for compensation and medical rehabilitation.

The patient with back complaints is often viewed with some suspicion. This skeptical attitude is probably more prevalent in an industrial than in a private practice, and undoubtedly the compensation factors are responsible. All physicians have had experience with the individual who says he has a weak back, or has back complaints and is unable to do certain kinds or any kind of work, but who is able to engage in all kinds of recreational and other activities. Not the least of the circumstances that prompt us to adopt a slight degree of skepticism regarding the validity of the average back case is the well-known rapidity with which the chronic case recovers once a monetary settlement is completed. Back ailments both real and imaginary were and are reasons given for asking deferment from service in the armed forces.

It is a major diagnostic problem to evaluate the presenting symptoms resulting from a back injury and properly classify the resultant pathologic findings. Even the integrity of the patient must be considered. Being neurosurgeons who see many referred patients with back complaints, I know you will agree with me that many patients who have true pathologic changes in the back are ignored until they are totally incapacitated, and many others are sympathized with, treated, and even compensated for nothing more than unproved statements.

The head of the compensation department of a large industry recently asserted that he had observed that the heaviest incidence of back cases was noted by his company's medical department early in the spring. He stated that the next heaviest incidence of this type of case occurs during periods of rapid changes in outside temperature. During the summer months, patients with back complaints are few in number, he said, but the season with the fewest back complainers is during the coldest months of winter.

A claims representative for a large industrial concern was asked by an associate if his organization were having much trouble with back injuries. "Well," replied the claims man, "it has been my observation that we have as many back injuries as there are backs."

Of course, that is an exaggerated estimate, given in a spirit of levity, but it must be admitted that back injuries constitute one of the most vexing problems of the industrial physician and his associates. It also is an established fact that back injuries are among the most expensive and make the greatest inroads on productive capacity of any disablement due to occupational injury.

IN OUR clinic we attempt to classify true back injuries into one of four types:

1. Strain.
2. Intervertebral disk injury.
3. Aggravation of predisposing disease.
4. Fracture.

Of all of these, fractures of the spine are the only back injuries which as a rule do not present much difficulty in establishing causal relationship, and the treatment of them is well established.

We believe that the predisposing factors to back strains are incorrect lifting, faulty posture, hypertrophic changes, and anatomic variations.

It is said that there are four main reasons for back pain: posture, trauma, arthritis, other diseases and neoplasms. I believe that in most chronic cases of back pain, posture, trauma and arthritis all play a part.

In 1911, Middleton and Teacher published in the *Glasgow Medical Journal* an article entitled "Injury of the Spinal Cord Due to Rupture of the Intervertebral Disk During Muscular Effort." In 1929, Dandy described loose cartilage from the intervertebral disk simulating tumor of the spinal cord; but it was not until 1934 that Mixter, a neurosurgeon, and Barr, an orthopedist, first emphasized the frequency and importance of disk injury. Since then the subject has excited wide interest and has become highly controversial as to both etiology and treatment.

Certainly from the industrial physician's point of view, aside from actual fractures of the vertebrae, perhaps the most disabling and the most perplexing type of back injury is the herniated intervertebral disk. Not only is it difficult to make a positive diagnosis, but outlining the proper manner of treatment is not easy to do. Many patients with back complaints are examined by competent physicians and no good reasons for their symptoms are found. Eventually some of these may arrive at the diagnosis of herniated intervertebral disk. After several episodes

Presented at the annual meeting of the Neurosurgical Society of America, Sea Island, Georgia, September 15, 1950, as part of a panel on Herniated Lumbar Disks.

of pain and discomfort, they are operated upon, and in some of them a herniated disk is found. Following operation, complete relief of pain is experienced by some, while others seem to have obtained no relief. Many are operated upon several times without relief. Others, after operation, are never able to return to their former jobs.

It is common knowledge that there is considerable difference of opinion in the medical profession as to the methods and efficiency of the treatment of posterior protrusion of the nucleus pulposus from ruptured intervertebral disks. Underlying this there is an even greater divergence of views as to the criteria that must be met before diagnosing this condition.

IN ORDER to obtain statistics regarding intervertebral disk operations, I solicited the aid of the chairman of the Industrial Commission of a large state.* He furnished me with an analytic study of 100 cases coming before the Commission in 1948 and 1949. This revealed some highly interesting facts.

For example, it was found that the average claimant was totally disabled for a period of 39.11 days prior to the operation (Table I). This time was utilized chiefly for diagnostic purposes which usually required hospitalization and x-ray studies of the suspected area of the back. Most of the cases occurred in the lumbar area with involvement of the lower lumbar or first sacral vertebrae. The statistics also showed that an average of 3.77 days of partial disability occurred before the operation. This represents, for the most part, time when the patient was able to work only part time because of his back complaints.

It might be well to note that in many instances the initial injury was slight, and even in some cases vague. Back sprain or strain, usually while lifting or stooping, was listed frequently as the causative factor.

The cost of the temporary total disability prior to operation averaged $115.00 per case, while the partial disability was $5.34.

The period of hospitalization was comparatively short in each instance, with an average of 27.47 days. The average hospital cost was $311.00 per case. The average surgical cost was $278.00, and x-ray examinations averaged $32.40. Nursing care averaged $22.21 per case. Medical supplies, in addition to the hospital charges, averaged $39.21 per case.

The period of temporary total disability, beginning with the date the claimant entered the hospital and extending until he returned to work, averaged 133.53 days, at a cost of $494.45. In addition to this, in some claims there was a permanent partial disability remaining after the claimant returned to work, amounting to an average of 38.7% of total disability. The cost of this additional disability represented as a settlement with the patient averaged $1,823.00.

*R. W. Morse, Chairman, Industrial Commission of Ohio.

TABLE I.
HERNIATED DISKS: 100 CASES

1. Days of temporary total disability lost prior to operation, average		39.11
2. Days of temporary partial disability lost prior to operation, average		3.77
3. Cost of temporary total disability time lost prior to operation, average		$ 115.00
4. Cost of temporary partial disability time lost prior to operation, average		$ 5.34
5. Period of hospitalization, average number of days		27.47
6. Hospital costs, average		$ 311.00
7. Surgeon's fee, average		$ 278.00
8. Cost of x-rays, average		$ 32.40
9. Total cost of temporary total disability from day entered hospital to date returned to work, average		$ 494.45
Days of temporary total disability starting with day entered hospital to date returned to work, average		133.53
10. % permanent partial disability after operation and return to work, average		38.7%
11. Cost of permanent partial disability or settlement after return to work, average		$1,823.00
12. Cost of nursing care, average		$ 22.21
13. Number of cases completely recovered after operation	Yes	50
	No	47
	Doubtful	3
14. Type of operation:	Laminectomy	61
	Laminectomy and fusion	39
15. Type of surgeon:	Orthopedic	44
	Neurosurgeon	51
	Team: Orthopedic-Neurosurgeon	3
	General Surgeon	2
16. Medical supplies, average cost		$ 39.21
17. Average total cost of each claim		$3,120.61

THE benefits to the patient from a disk operation have been discussed at considerable length. This study provided some information concerning the results of this type of operation.

The survey of these 100 claims showed that the number of cases completely recovered after operation was 50. Three were listed as being doubtful as to the degree of recovery, and 47 cases were reported as not being completely recovered. This seems to indicate that the chances of a complete recovery following such an operation are approximately 50%. This, it must be agreed from a surgical viewpoint, is not an exceptionally good average.

As to the type of operation performed, of the 100 cases, 61 were laminectomies, while 39 were listed as laminectomies with fusion.

It is interesting to note that 44 of the operations in these 100 cases were performed by orthopedic surgeons, 51 by neurosurgeons, three by teams of orthopedic and neurosurgeons, and two by general surgeons.

For time loss, surgical and hospital care, nursing and medical supplies, the average total cost of each of these claims was $3,120.61. These figures support the earlier suggestion that back injuries are costly. As to the inroads they made on the patients' productive capacity, the average time loss was 203.88 days.

CONCLUSIONS: The results of intervertebral disk surgery do not appear to be too satisfactory. Too high a percentage of disk operations can be classed as unsuccessful. This leads to the question of whether operation is the answer to herniated nucleus pulposus. It also

leads to asking whether the criteria for disk surgery are well established. My own feeling is that in addition to symptoms and physical findings, in most cases it is necessary to demonstrate the presence of a disk by the use of some radiopaque material before recommending surgery to the patient.

The high cost involved in caring for the industrial herniated disk is probably reflected to the same degree in the non-industrial case. The patient loses time from his work, and in many instances is unable to return to his previous work. Thus, his personal financial loss is great. In the industrial case the high cost is a drain on both the employee's and the employer's resources. A labor turnover problem is created which also represents a costly infringement on the employer.

The period of temporary total disability prior to operation (an average of 39.11 days) is hard to explain. This supposedly represents the time required to make a positive diagnosis of herniated intervertebral disk after the physician has determined that some pathologic changes probably do exist in the back. On the average, 3.77 days of partial disability existed prior to operation. In other words, the patient was partially incapacitated for only 3.77 days for an ailment requiring 39.11 days to diagnose completely. Pursuing the same thought, in the treatment of an ailment of the severity to cause only 3.77 days of partial disability it is necessary to spend 39.11 days diagnosing the condition and 133.53 days in treating it. This would not be so bad except that the patient seemingly has only a 50% chance of recovery. To top this, this same ailment requiring only 3.77 days of partial disability is severe enough to cost someone at least $3,120.61 to attempt to correct. Of course, I realize that this is mathematical juggling but it certainly is thought provoking.

SUMMARY: Each case of back pain should be thoroughly evaluated by competent physicians as soon as possible after inception. A proper diagnosis should be made as rapidly as possible, and the patient advised as to proper therapeutic measures. Only by vigorous pursuing of the back case can we hope to effect a greater number of cures, more quickly, and at less cost.

(500 South Main St.)

How Old is Old?

FACED with the unanswerable question, "How old is old?" the National Conference on Aging, held in Washington last August, nevertheless wrestled with some success with the problems associated with the increasing proportion of older persons in our population. Among the 808 delegates representing diverse professional fields and public groups, one opinion prevailing over all others appeared to be that to define age in term of years is meaningless, and that retirement plans based on chronology are wasteful, blundering, full of long range dangers to the nation, and even capable of wrecking the nation's economy. "Old age is always five years older than you yourself are," was one delegate's opinion. Another might have said 20 years older. It was Victor Hugo who aptly described 40 as the old age of youth and 50 as the youth of old age. So, be age what it may, there was wide agreement among the delegates that instead of retirement at a fixed age, retirement plans must be tied to disability. But, what is disability?

—From "Editorials and Commentaries," in *J. Florida Med. A.*, 37:5, 302 (November) 1950.

LOW BACK SYMPOSIUM

The Protruded Lumbar Intervertebral Disk as a Cause of Backache

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SINCE the work of Mixter and Barr, of Boston, the criteria for the diagnosis, and the pathologic changes and definitive surgical therapy for the correction, of the protruded intervertebral disk have become thoroughly established. No patient suffering with low back pain, with or without sciatic pain, is evaluated completely until the existence of a protruded intervertebral disk in the lumbar region is ruled out diagnostically.

In the majority of cases of protruded lumbar intervertebral disk, low back pain and sciatic pain constitute the symptom complex. However, backache is the sole manifestation of this lesion in many cases. The protrusion occurs at the fourth and fifth lumbar interspaces in over 90% of the patients. The lesion occurs more frequently in men, and in patients in their fourth decade.

Trauma to the back frequently plays a part in precipitating low back pain resulting from a protruded intervertebral disk. The trauma may be minimal or severe, and the backache usually has its onset immediately following. Characteristically, the backache runs an intermittent course throughout the history, with the patient frequently experiencing episodes of complete freedom from his distress. In other cases, the backache is intractable, the remissions being less pronounced or absent. The pain usually is located in the lumbosacral region, and frequently is described as "going into the hip joint." Most often it is aggravated by activity and relieved, to varying degrees, by bed rest.

Pain radiating along the course of one or both sciatic nerves may have its onset simultaneously with the low back pain, or at varying intervals of time following. The sciatic pain may alternate from side to side or be bilateral, but the distress is ordinarily confined to the side of the protrusion. It is felt with maximal intensity deep in the gluteal region and along the posterior surface of the thigh and in the calf of the leg. It is usually a dull aching pain, but a history of shooting pains or pains of a radicular nature radiating along the entire path of supply of the nerve root involved, occasionally is elicited from the patient. The sciatic pain frequently presents remissions and exacerbations throughout the history, and the intervals of freedom may be relative or complete for varying periods of time. It is aggravated or precipitated by coughing, sneezing, straining, or by an activity, and frequently is relieved by bed rest, although it is present during the night in a great many patients.

Paresthesia often is mentioned by the patient. The symptom is experienced along the lateral aspects of the leg, the plantar surface, or the medial or lateral borders of the foot, depending upon the nerve root involved. Occasionally, this distress is felt along the entire course of the involved root. Sphincteric disturbances occur occasionally with a protruded intervertebral disk.

FOR proper evaluation of the patient, a general physical examination, as well as neurologic, roentgenologic, and spinal fluid examination should be accomplished.

The patient frequently walks with a limp, favoring the painful side. When standing, the knee of the painful limb often is flexed, and the pelvis is tilted so that the iliac crest on the affected side is lower. A list may be observed, usually away from the involved side. The normal lumbar lordosis is obliterated to varying degrees, and there is some limitation of motion of the back, especially on forward bending. The latter position may allow observation of alternating scoliosis. Spasm of the paravertebral muscles is the rule and may be unilateral or bilateral. Frequently, there is found some tenderness in the lumbar region, especially over the spinous processes of the fourth and fifth vertebrae and along the paravertebral areas.

Tenderness along the course of the sciatic nerve of the painful leg is encountered. Points of maximum tenderness are at the gluteal fold, the mid-posterior thigh, the popliteal space, and the calf.

The Achilles reflex often is found to be depressed or absent, but the patellar and hamstring reflexes rarely are altered. Sensory changes along the path of the involved nerve root, or roots, can be demonstrated frequently. Hypesthesia is common but anesthesia is observed occasionally and hyperesthesia is not unknown.

The sign of Lasegue commonly is positive, and straight leg raising on the painful side is limited to 30° or less. Forced flexion of the non-painful leg may cause distress on the painful side. Weakness of motor power may be demonstrable, especially in the dorsiflexor muscles of the toes and foot.

The roentgenologic examination should include plain x-rays of the lumbosacral spine, and, in the majority of cases, roentgenograms of the lower dorsal and the lumbosacral areas,

This Low Back Symposium was a feature presentation at the Scientific Monthly Meeting of the Jackson County Medical Society, Kansas City, Missouri, February 28, 1950.

following the introduction of radiopaque contrast media into the lumbar subarachnoid space, should be obtained. The plain x-ray films are important in ruling out skeletal abnormalities, but their value in making a positive diagnosis of protruded intervertebral disk is not great.

Pantopaque is the material of choice as a contrast medium, and three cubic centimeters is usually sufficient. Before its introduction, tests for spinal subarachnoid block should be accomplished, and a specimen of spinal fluid for laboratory analysis should be obtained. Demonstrable subarachnoid block and a protein level in the spinal fluid above 40 milligrams are not consistent with protruded intervertebral disk, and with these findings one should consider spinal cord tumor.

Surgical removal is the only effective means of treating the patient with protruded intervertebral disk. All other methods of therapy are only palliative and the relief obtained in the majority of cases, is short lived.

Urologic Aspects of Backache

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UROLOGIC conditions are of definite importance in the diagnosis of the patient with a low backache. The failure of consideration of such problems in the diagnosis of this condition may be one of the factors producing chronicity in this type of complaint. The back pain associated with urologic conditions is found frequently in conjunction with mild aches and paresthesias of the medial aspect of the thighs and, also, with a suprapubic ache that tends to radiate to the umbilicus.

For all practical purposes, diseases of the upper urinary tract are of little importance in producing pain low in the back. When chronic infection exists, however, in the upper urinary tract it may produce pathologic conditions in the lower urinary tract which will produce pain low in the back.

Diseases of the bladder may produce this pain; however, such conditions produce other symptoms that make the diagnosis of pathologic changes in the bladder evident. It is unusual for back pain alone to be caused by the diseases of the bladder.

The most common urologic condition producing low back pain is chronic prostatitis. This usually is secondary to a focus elsewhere in the body, and, unless the focus can be eliminated, the cure of the prostatitis may be difficult. One of the chief reasons, also, that prostatitis may fail to respond to the usual therapy is that this condition frequently is associated with a stricture in the posterior urethra and congestive posterior urethritis. In our opinion, the posterior urethritis chiefly is responsible for the production of congestion and spasticity of the surrounding muscle groups in the deep pelvis. The muscle spasticity, apparently, is an important factor in the production of this back pain, since heat and massage of these muscles, by way of the rectum, can give temporary relief. In the urologic examination for the cause of pelvic pain the prostate must be massaged carefully without too much trauma, and the expressed secretion must be examined for the presence of pus and bacteria. The gram stain will help differentiate the types of invading organisms, and thus aid in determining the type of medication that will give the best result. One examination of the prostate is not sufficient to rule out the diagnosis of prostatitis, as frequently the second and third examinations, spaced three or four days apart, may show the presence of pus or bacteria. After examination of the prostate, it is important that the patient be checked carefully for any obstruction or stricture formation, as such a condition in the urethra, and particularly in the posterior urethra, interferes with proper prostatic drainage and increases congestion in the posterior urethra. The passing of a sound through the urethra is insufficient to diagnose a urethral stricture. The calibration of the urethra with a bulb bougie, preferably a size F 22, will demonstrate or eliminate most all significant strictures. Even large caliber strictures may interfere with prostatic drainage and produce posterior urethral congestion.

Should the prostatitis and the stricture not be eliminated, then the congestive urethritis will, in time, show granular and cystic changes throughout the mucosa of the posterior urethra and will involve the veru montanum. When this occurs, the patient frequently will complain also of poor erections and premature ejaculations in addition to back pain. The diagnosis and treatment of the cystic granular posterior urethritis is accomplished by means of the urethroscope and the use of astringents such as weak silver nitrate solutions, or light electro-coagulation. If therapy can be directed toward the elimination of the prostatitis, the stricture, and the posterior urethritis, then there is a much better chance that elimination of one or all three of these conditions may be accomplished. If a chronic prostatitis only is found, then gentle prostatic massage along with the administration of antibiotics should give a good result, after foci of infection have been eliminated. Should the bacterial flora in the expressed prostatic secretion show a predominance of gram-positive organ-

isms, then penicillin or sulfonamides should be used. We have found that large doses of sulfonamide are not necessary and, at the present time, we are using sulfadiazine in 0.5 gram doses, four times daily, for a 10-day period. Should the gram-negative group of organisms predominate, we prefer to use sulamyd or aureomycin or chloromycetin. The treatment of the urethral stricture should be undertaken by gradual dilation of the stricture. The size of the dilator to be used at first is determined by the caliber of the stricture, as denoted by the use of the bulb bougie. Increasing the size of the dilator at weekly intervals until a normal caliber has been reached, then repeating the dilations at monthly intervals for six to eight months with the larger size sound, should give relief of the stricture. We feel that a caliber of at least an F 28 is necessary for the posterior urethra. In many cases, the anterior urethra and the meatus will not permit introduction of such a dilator and a urethral meatotomy must be done. If the anterior urethra fails to admit this size dilator, then one should resort to the use of a Kollman dilator. As pointed out previously, the treatment of posterior urethritis is done best by means of the urethroscope, after the stricture and prostatitis have been eliminated.

In women, pain low in the back may be caused by pathologic changes in the urethra and periurethral glands. A congenital or acquired meatal stenosis predisposes to a granular, cystic type of urethritis with congestion and inflammation of the complex peri-urethral glands. The symptoms are manifested usually by recurrent frequency, urgency, and nocturia associated with low back pain and, frequently, a suprapubic ache radiating toward the umbilicus. Meatotomy and endoscopic coagulation of the granular and cystic changes have produced the best results in our experience. Elimination of an obstruction however slight, is of paramount importance in eliminating disease in the female urethra.

Carcinoma of the prostate, of course, may produce a low back pain and frequently this complaint is the only symptom that the patient may have until enough obstruction exists at the bladder neck to produce urinary symptoms. Careful palpation of the prostate will show areas of firmness or nodular areas that deviate from the normal smooth, soft, and symmetric type of gland. Any firmness in the gland must be considered as neoplastic change until proved otherwise. X-ray studies of the pelvic and lumbar spine may show the definite bone changes of metastatic carcinoma of the prostate. Therapy of this condition must be radical prostatectomy, if the diagnosis can be made before fixation of the gland has occurred. After fixation, radical prostatectomy is of little value. Bilateral orchidectomy, or estrogenic therapy, or a combination of these two is the procedure of choice after fixation of the gland has occurred or after metastases are evident.

In review, the usual urologic conditions that may produce pain low in the back have been outlined.

The examining physician must consider these possibilities when working with patients presenting this complaint.

Orthopedic Aspects of Backache

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IN THE discussion of the orthopedic aspects of back pain, an outline of some of the principal causes, and the outstanding points in the history, symptomatology, and therapy will be given.

The most common cause of the backache seen by the orthopedist is posture, which may or may not be associated with definite organic change. The usual history obtained from these persons is that a dull, progressive aching in the lower portion of the back has appeared after the patient has been on his feet for a length of time, which gradually spreads up the back to the shoulders, and to the base of the skull. This at times is associated with a headache radiating forward from the occiput, spreading over the top of the head. This type of backache, occupationally incurred, is seen high in the back in those occupations where the person sits for prolonged periods, bending forward over his work. The pain is not present in the morning, but appears as work fatigue, and becomes gradually more severe in character as the day progresses. Examination usually reveals a patient of poor muscular development, with flat feet, with an increase in the normal lumbar lordosis, an increase in the dorsal kyphosis, and who carries his head forward of the sagittal plane of the body. The abdominal musculature is poor, ptotic in character, and the chest expansion is limited. These are the persons whose "chests have fallen."

X-ray studies of the back usually show little, apart from the increase in the sacral inclination and the exaggeration of the normal lumbar, dorsal, and cervical curves. These patients are improved by postural exercises, and by general improvement in their physical conditions and, if the patient is a woman, by proper corseting. It might be stated that women tolerate back supports much better than men, so that in the conservative management of all back problems, the former respond much better than male pa-

tients, for the man cannot, or rather will not, as a rule tolerate external back supports.

If the source of the pain is occupational in nature, a study into the particular job should be made and steps taken to correct the causes. For example, a chair may be lowered to relieve strain, a pillow may be added to a seat, the position of the machine may be shifted, and, in the case of a dentist, the changing of the foot control of his drill may be enough to relieve the strain on the back.

The second type of postural backache usually occurs in the so-called "muscle bound" persons. Here, the backache is aggravated by sitting or prolonged standing. Double-feature movies and long automobile rides aggravate the back pain. The pain is localized to the lower portion of the back, and usually these patients have been relieved by osteopathic manipulations. On examination, the motions of the back in forward bending are limited. The hamstrings are tight, and the lateral and anterior thigh fasciae are extremely tight. There is also an increase in the lumbar lordosis. As before, the x-rays are interpreted as showing only an increase in the sacral inclination.

Treatment in this type of case consists of exercises directed toward stretching these tight structures. In the resistant cases it may be necessary to divide the tight structures surgically before relief can be obtained.

Another cause of low backache is the congenital deformity in the back demonstrable by x-ray study. These patients give a long history of repeated attacks of low back pain, usually associated with activities or minor trauma. The exact role of trauma superimposed upon these congenitally weak backs is hard to evaluate. However, one does know that when such a back is subjected to injury, it is much slower to recover than if the bony structure were normal. In the injury case, either private or industrial, it is extremely difficult to explain to the patient why the continuation of his back pain is due to this congenital weakness, and not entirely to the trauma.

The pain in this type of case is usually located in the lumbosacral area, especially over the attachments of the heavy lumbar muscles to the pelvis, and over the iliolumbar ligaments in the region of the posterior superior spine of the ilium. Here, there may be radiation of pain into the gluteal region and even down the lateral side of the thigh. The pain is aggravated by motion and usually is relieved by rest.

Examination reveals muscle spasm in the lumbar muscles with some general limitation of back motion, and there is percussion tenderness over the lumbosacral area. X-rays show a type of congenital deformity in the bony structure of the lower portion of the back. These congenital anomalies fall into four general classes—mal-development of the facets and pedicles, defects in the neural arch, abnormal development of the transverse processes, and deformities of the vertebral bodies. These patients may show any combination of these types.

The treatment of this type of case in the acute phase of the original attack is extremely important, for without proper vigorous therapy these individuals are likely to have chronic backache. In the severe case, bed rest with traction is the treatment of choice. When the pain is relieved, rehabilitating exercises are instituted and the back is supported by a properly fitting low support. In the less severe case, injection of the acutely tender areas with procaine may give relief, and then rehabilitating exercises can be instituted along with low supports. If the case is chronic the only lasting relief that can be obtained is by spine stabilization. In these cases there may be also a herniation of the nucleus pulposus, but the treatment of this condition is being covered elsewhere in this symposium. If herniation is associated with a congenital abnormality of the lumbosacral area, a lumbosacral fusion should be carried out at the same time as the herniation is relieved.

The last group of conditions producing pain low in the back consists of the various types of arthritis. One example will be mentioned from this group—the Marie-Strumpell type of spondylitis and osteoarthritis.

Marie-Strumpell's spondylosing arthritis attacks young adults, the majority of cases being seen in men. The history and description of the pain given by the patient may be vague and indistinct, and since the individual suffering from spondylitis is of the asthetic type, he is usually thought of as having a neurosis. However, on close physical examination it is found that there is generalized limitation of all back motions, and especially a limitation of chest expansion. In this type of back pain the laboratory findings can be of definite value. There is usually a mild anemia, achlorhydria, low basal metabolic rate, and an increase in the blood sedimentation rate. The x-rays show rather early a destructive process in the sacro-iliac joints, and, as the disease progresses, the small joints of the spine are involved, and in the far advanced case a complete ankylosis of the spine occurs.

Treatment in these cases requires hospitalization. The patient is given a complete physical examination, and then he is placed in as good physical condition as possible. The pain can be relieved by x-ray therapy. The patient is placed on a hyperextension frame to gain as much correction as possible. Then postural exercises are instituted to hold this correction, and the chest expansion is improved through use of blow bottles. A light postural brace is used to prevent recurrence of the deformity. These patients must be followed, with special attention being given at all times to their posture, and thus they can be saved from a life of invalidism and made useful citizens.

Osteoarthritic changes found by x-ray in a patient suffering from pain low in the back must not be considered causative until all other possibilities are eliminated. The typical patient with back pain due to osteoarthritis is a middleaged, obese person with a chronic backache, which is worse in the morning, and which improves as the day progresses, provided the back is not subjected to too much stress and strain. The aching appears again after a few hours of relaxation and interferes with rest at night.

Examination reveals marked limitation of back motion, with loss of the lumbar arc, and there may be muscle spasm. The pain is localized to the lumbar spine, and aggravated on the extremes of motion.

There usually is evidence of osteoarthritis in other joints, principally in the fingers and knees.

X-rays in these cases show osteoarthritic changes in the lumbar spine. The degree of change varies from person to person, therefore, just because osteoarthritis is found in the lumbar spine, it might not be the cause of the back pain. The diagnosis is made only by elimination, and only after an extensive search for other causes is completed.

These patients are treated by improving their general physical condition, including weight reduction. Their body mechanics are corrected as much as possible, and they must be taught to live within the functional capacities of their backs. Supports are indicated only in the more severe cases, for it is desirable to maintain as much motion in the spine as possible.

Other causes of backache such as metastatic carcinoma, the myelomas, tuberculosis, syphilis, scoliosis, post-menopausal or senile decalcification, fracture, and other traumatic lesions to the spine have not been discussed.

In summary, some of the most common causes of pain low in the back have been presented. It must be remembered that cases do not fall sharply into the classes mentioned, but usually show portions of all types, and need conscientious study. There is no substitute for a complete history, a thorough and intelligent physical examination, and appropriate, adequate x-ray studies. With these as a basis, satisfactory treatment will follow.

Obstetrical and Gynecological Aspects of Backache

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BACKACHE in pregnancy is an extremely common complaint and, while its nature is most often orthopedic, the obstetrician usually is called upon for palliation. The increase in abdominal content causes a shift in the center of equilibrium in the pregnant woman that is of such a degree as to require increasingly exaggerated postural adjustments. Joint strain low in the back is an obvious concomitant, and therapy aimed at approaching a more normal body posture is of value. Simple instruction as to standing straight and habitually holding the buttocks together so as to increase abdominal tone may help considerably. High and narrow shoes should be replaced, and a hard bed almost always is helpful. Local heat is a useful measure in the more severe cases, some of which may require adhesive strap support. The majority of patients experience considerable relief on wearing a snug corset or similar abdominal support.

There are also physiologic changes in pregnancy, at least in part hormonal in nature, that cause excessive mobility of the pelvic joints, and frequently are of significance in the production of backache. This relaxation of the joints usually causes symptoms in the second trimester, and reaches a maximum about the seventh month. The so-called "pelvic arthropathy of pregnancy" of Young well describes the process. Pain produced by manipulating the patient in such a way as to place strain on the symphyseal and sacro-iliac joints is diagnostic of the underlying pathologic changes. X-rays will show a separation of the symphysis. Depending upon the degree of disability, these patients will affect a gait varying from a slight limp to a waddle. Obviously, restriction of activities is necessary, and a strong abdominal support should be prescribed. Occasionally complete bed rest may be the only course.

It is evident that increased pelvic vascularity and, more especially, increased pelvic varicosities with resultant altered circulation and attendant edema can cause pain low in the back. Multiparity is an important factor here.

Aside from the various changes seen in pregnancy, there are also factors in labor and delivery which can cause backache of considerable post-partum importance. A prolonged, exaggerated lithotomy position is far too frequently a cause. There is no reason to believe that a "saddle block" anesthesia produces persistent backache although this sometimes is associated with the pain by the patient.

Trauma to pelvic joints produced by the child's passing through the birth canal is relatively common, and the degree is, of course, made greater by undue force, especially with improperly directed forceps. In extreme cases there may even be a tearing of the capsular ligaments with hemorrhage into and around the capsule. Cartilage rupture can occur. Dis-

ability may be great from back pain in these women, and definitive specialty orthopedic treatment is required.

Since the coccyx must move posteriorly at least two or more centimeters in order to accommodate the passage of the infant's head, varying degrees of injury such as sacro-coccygeal joint damage, dislocation, fracture, or pericoccygeal cellulitis may occur with a resultant coccydynia. While the course of such coccydynia often is prolonged over many months, recovery usually is spontaneous. In refractory cases, heat and massage may be of some value. Removal of the coccyx so often fails to provide relief that many feel that the operation is not indicated.

Post-partum cellulitis, particularly when severe, may produce adhesions, impaired circulation, and chronic inflammatory processes resulting in permanent backache. Surgery, except of course in the event of persistent abscesses, is generally ineffective owing to the extent of the tissue involvement. Heat therapy may be of some help, and presacral neurectomy, including division of the infundibulopelvic ligaments, offers palliation to some with severe disability.

SUCH a discussion leads automatically to the field of the gynecologist and a consideration of chronic pelvic inflammatory disease as a cause of low back pain. Inflammatory changes can, of course, cause arthritis and myositis, as can abscessed teeth and tonsils, while chronic gonorrheal pockets in Skene's and the cervical glands can sometimes be the basis of the backache. However, such conditions are rare. Of immensely greater importance is the recognition of the circulatory, and possibly even hormonal, changes associated with chronic pelvic inflammation. The boggy, somewhat fixed uterus often plays the offending role in persistent pain low in the back. Here, one repeatedly sees cases where hysterectomy has failed to produce the intended good results.

The part played by pelvic edema in the production of pain and backache, both in connection with chronic inflammatory processes and where no specific pathologic change can be demonstrated, is being recognized increasingly. Hormonal therapy, in particular thyroid, and the use of vitamin E are coming more and more to the fore.

The chronically infected cervix is of great importance etiologically. The inevitably associated pelvic lymphangitis, especially around the uterosacral ligaments, often gives the patient persistent back pain, and "broad ligament neuritis" from chronic cervicitis is recognized. Endocervical cauterization or conization is an indicated therapeutic procedure.

Often, a long standing, deep, constant backache and "dragging sensation" can be seen in patients with prolapse, and the usually associated cystocele and rectocele. Retrodisplacements of the uterus, a condition so common as to fall within the bounds of normality, *occasionally* can cause similar symptoms. In such situations the conscientious gynecologist should always demonstrate relief of pain on maintaining replacement of the pelvic organs by means of a properly constructed pessary. Only then can surgery be recommended as a means of cure, and even then there should be reservations since frequently the desired result is not obtained. That there are far too many uterine suspensions performed needs no comment.

Endometriosis should be mentioned in passing as an occasional reason for backache. It is interesting that the amount of ectopic endometrial tissue does not seem to relate to the degree of disability. Conservatism in treatment is the keynote and ablation of the ovaries is a desperate measure at best.

Probably the most severe and unremitting low backache is that caused by metastatic pelvic carcinoma. In those cases where cervical or fundal cancer has involved the sacrum or sacroiliac regions, the patient usually suffers greatly. Specific local palliative treatment is unsuccessful, and even chordotomy is sometimes employed.

Evaluation of the pain itself in those complaining of backache, and careful consideration of the differential diagnosis are of utmost importance. A radical procedure for cure should be the extremely exceptional choice.

(Professional Bldg.)

NO

AT THE San Francisco Session of the American Medical Association, June 26-30, DR. STANLEY H. OSBORN, Section on Preventive and Industrial Medicine and Public Health, presented two resolutions, the first proposing that the words "and Industrial" be omitted from the title of the Section, so that the title would read "Section on Preventive Medicine and Public Health"; and second, that a new scientific section be established under the heading "Section on Medicine in Industry." Both resolutions were referred to the Council on Scientific Assembly. The report of that Council, as published in *J.A.M.A.*, October 21, 1950, says that, after consideration of the resolutions, the Council recommends (1) that the name of the Section on Preventive and Industrial Medicine and Public Health be *not* changed, and (2) that a Section on Medicine in Industry be *not* established.

Syllabus on Industrial Low Back Disability

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FOREWORD

Low back pain constitutes one of the major problems in industrial medicine today. A review of the medical literature makes it all too clear that there are vast gaps in our knowledge of the subject and that little is known regarding the proper management of this condition.

This Syllabus is presented as the first report on an investigation of industrial low back pain that was undertaken two years ago by the American Mutual Liability Insurance Company with the cooperation of representatives of the Harvard Medical School and the Massachusetts General Hospital. The project has been under the direction of DR. JOSEPH S. BARR, Chief of Orthopedic Service, Massachusetts General Hospital, and DR. HENRY C. MARBLE, Surgical Director, American Mutual Liability Insurance Company. The case studies—all of industrial origin and drawn from the records of the American Mutual Clinic in Boston—have been handled by DR. JOHN E. STEWART and DR. THORNTON BROWN.

The first draft of this Syllabus provided the basis for a panel discussion of "The Industrial Back Problem" at a Seminar on Industrial Medicine and Surgery sponsored by the American Mutual in March, 1950. The following doctors participated in the discussion and made valuable contributions to the final report: DR. CHARLES E. AYERS, Worcester; DR. RICHARD C. BUCKLEY, Hartford; DR. JOSEPH H. SHORTELL, Boston; and DR. T. CAMPBELL THOMPSON, New York City.

The amended Syllabus was first presented to the medical profession by DR. BARR at the October, 1950, meeting of the Kansas City Southwest Clinical Society, and it is now published with the hope that all who read it will regard themselves as participants in this study and will contact us with any ideas, suggestions, or criticisms that may help us toward our common objective.

—RICHARD B. COOPER, Director of Medical Relations, American Mutual Liability Insurance Company, 142 Berkeley Street, Boston, Massachusetts.

I. INTRODUCTION

In the treatment of this ever present and perplexing problem, the first and all important step is to make every effort to arrive at an accurate and exact diagnosis. If this is done, treatment can be started along rational lines and the situation can be explained to the patient so that his confidence is gained and he will cooperate in the sometimes long and discouraging convalescence from the injury. Accordingly, this syllabus attempts to outline an adequate examination of the patient, including x-ray and laboratory studies, then presents a simplified diagnostic classification, and, finally, briefly summarizes treatment.

II. HISTORY

PAST HISTORY: (A) *Age:* Under 30, especially if there is a history of previous back trouble, congenital weakness, such as spondylolisthesis, postural defect or rheumatoid arthritis should be suspected. Most ruptured disks occur in the third and fourth decade. In the fifth and sixth decades degenerative changes predominate. However, there is a wide variation; for example, ruptured discs occasionally occur even in the teen-age group.

(B) *Occupation:* (a) Back Pain as Related to Heavy Industry: It is one of the most common disabilities and the most troublesome to treat. In the American Mutual Clinic in 1943, 8% of all admissions were for this complaint. Prolonged repetitive heavy work predisposes to back disability. (b) Relation of Back Disability to the Length of Time the Man has been Employed: Many back injuries occur in people unaccustomed to heavy labor who recently have started employment of this type. A recent change in occupation alone may result in back disability without definite trauma. (c) Premature Degenerative Changes in Men Employed at Heavy Labor: Hypertrophic arthritis and disc degeneration are more frequent and occur at an earlier age in the heavy laborer. (d) Patient's Feeling about His Job: Is He Contented or Discontented? Rehabilitation of the discontented worker is notoriously more difficult. Exaggeration of symptoms is frequently encountered. Inquiry should be made as to how long he has had his job and how many other jobs he has had. If employed for many years, he is almost certainly sincere. If he has changed jobs frequently, more careful evaluation is necessary. Sooner or later, everyone doing heavy labor reaches the age when he can no longer do his work. Prolonged disability from a minor injury may be due to the fact that he is physically unable to continue at that type of work. (e) Compensation Aspects: The financial situation and legal proceedings pending are important considerations. The patient's economic status may be such that he is happier receiving compensation than at work. Conversely he may run so heavily into debt after a long period of disability that his back pain becomes an escape mechanism. Symptoms are notoriously persistent before legal settlement.

(C) *Previous Back and Leg Pain:* (a) Importance of Old Injuries in the Development of Lumbosacral Pathology: Previous trauma may produce fractures or traumatic changes in the apophyseal joints leading to degenerative arthritis or initiate premature disc degeneration that leads to instability or disk prolapse. (b) Importance of History of Previous Back Pain with or without Leg Pain in Diagnosis of Disk Lesions or Instability States: Recurrent episodes of pain in the past suggest mechanical abnormality which may be rupture of a disk or other defect.

SYSTEM REVIEW: (A) *Importance of Ruling out Other Pathology Besides Simple Trauma:* Many diseases may produce the signs and symptoms of low back trauma.

(B) *History of Cancer or Symptoms Thereof:* Prostate, breast, hypernephroma, etc.

(C) *History of Rheumatoid Arthritis or Suggestive Symptoms:* Arthralgia, fatigue, weight loss, vasomotor disturbances, morning stiffness.

(D) *History Suggestive of Gout:* This is an occasional cause of back pain.

(E) *History of Urological or Gynecological Diseases or Symptoms:*

(F) *History of Focal Infection:* Abscessed teeth, sinusitis, tonsillitis, etc.

PRESENT HISTORY: (A) *Precipitating Injury:* (a) Description of Patient's Position when Injury Occurred and an Analysis of the Force Applied to His Back During the Injury: Lift, pull, twist, push, or fall. The type and weight of object being handled should be recorded. If a lift, push, or pull, when did the pain occur—as he was getting into position or as he actually applied force? (b) Description of What Happened: Was there a snap, click, or tearing in back? Were pain and disability immediate or only after a latent period? Was there immediate or delayed leg pain? Were paresthesias present or absent? What was the location of initial leg pain? Was there inability to straighten up, temporary paralysis of a leg, etc.? (c) Description of Activities after Injury: Did he quit immediately or finish the day? This gives information as to severity of the injury and the patient's threshold to pain.

(B) *Previous Treatment and Results Thereof:* (a) Support: Belt, corset, brace, strapping. (b) Rest: Complete or partial bed rest, bed boards, traction. If bed rest at home, how much rest actually was obtained. Ordinarily rest at home is far from complete. (c) Heat: Heating pad, diathermy, lamp. How many diathermy treatments? Repeated and prolonged diathermy treatments are of no particular value and may actually produce tissue injury. (d) Manipulation: Osteopathic, other. Frequently osteopathic manipulations help initially, but sooner or later they either fail to relieve or aggravate symptoms. Failure of manipulations suggests more serious back injury. (e) Response to Above Therapy: This is of importance in the diagnosis and further treatment. Mechanical abnormalities and traumatic afflictions respond to the usual treatment ordinarily. Diseases, including primary and metastatic tumors, do not. Further therapy must be planned in the light of what has been tried before.

(C) *Present Status:* (a) Progress: Worse, same, improving. One should be suspicious of back disability that remains unchanged for a long period unless there is an adequate explanation for it. Usually it improves or gets worse. (b) Back Pain: *Location:* Erector spinae origin, lumbosacral junction, erector spinae muscle mass, origin of gluteus maximus, tensor fascia lata. The patient is asked to point to the location of his pain. An attempt should be made to describe this accurately. *Aggravated by:* Bending, lifting, activity, rest, special positions. *Relieved by:* Support, rest, activity, heat, special positions. (c) Leg Pain: *Location:* Buttocks, thigh, calf, foot, toes. It is important to describe course of radiating pain specifying to which toes it goes, for there is localizing value in the radiation of pain. Bizarre radiations up the spine and to the head suggest functional overlay, but may represent pain due to muscle spasm or to traction on an irritated nerve root accentuated by neck and trunk flexion. *Character of pain:* A dull vague discomfort in the thigh and occasionally in the calf suggests referred pain. Aching pain of dermatome distribution relieved and aggravated by certain positions and accentuated by increased intraspinal pressure suggests actual nerve root irritation, especially if associated with paresthesia. *Aggravated by:* Cough, sneeze, sitting, bending, prone lying or other positions. *Relieved by:* Bed rest, back support, hip and knee flexion, side lying. *Paresthesias,* localizing value, especially if referred to toes: In general the large toe indicates the 4th, the 5th toe the 5th disk. (d) List: Right, left or alternating. Patient usually notices this as prominence of opposite hip. (e) Present Disability Status: Ability to work. Ability to sleep. How is patient tolerating pain? Does he have a high or low threshold to pain?

III. PHYSICAL EXAMINATION

INSPECTION: (A) *Brace or Belt:* If the patient is wearing one, check this for type, adequacy, and how worn, before removing.

(B) *Movements:* Guarded or free: Note undressing and dressing, getting on and off examining table. These give some idea of severity of symptoms especially if observed without patient's knowledge.

(C) *Build:* Some note should be made as to the patient's height, weight, nutrition, and musculature. Weak abdominals, gluteals, and back musculature contribute to postural strain. The individual may be tall and thin or of relatively frail physique yet employed at a job necessitating heavy lifting, an activity for which he is not constitutionally suited.

(D) *Posture:* (a) Body Mechanics: Dynamics of whole body as patient stands and moves about during examination are observed. Note abnormalities such as increased lordosis, flat chest, stooped shoulders, forward-thrust head, lax abdomen. (b) List: Is it away from or towards side of pain? It is usually away but may be toward or rarely alternating. This is a protective mechanism, but the reasons for variations in list are not known. (c) Pelvic Tilt: Check leg lengths and note amount of lift under heel needed to correct list. Note effect of lift on associated scoliosis. A "list" is not corrected by a lift. A scoliosis due to a short leg is. (d) Scoliosis: "Sciatic" or structural. A sciatic scoliosis is a "list," an involuntary protective mechanism. A structural scoliosis is an established deformity with rotation which rarely is associated with acute back pain. (e) Lumbar Lordosis: Normal, flat, kyphotic. The acute back is usually flat, or even kyphotic, with a list. A chronic postural back strain usually has an increased lordosis. However, an "acute back" occurring in an individual with a lordosis fixed by degenerative arthritis is not flat. There is not enough motion in the lumbar spine to permit flattening in spite of muscle spasm. (f) Feet: Pronated, tight heel cords. These may contribute to a postural back pain.

(E) *Gait:* Note both with clothes on and off. It is often quite different. Normal or protective: The patient with an acute back walks in a cautious

manner frequently with a limp. Heel and toe walking: Normal or exaggerated. These may be painful if there is marked root irritation. Apparent great difficulty in doing these may indicate malingering. The patient is confused and does not know how he should act.

Back Motions

(A) TECHNIQUE: These should be performed actively at first. Later passive motions may be tried as a further check, especially if there is doubt as to degree of true limitation of back motion.

(B) *Standing:* (a) Forward Bend: Muscle spasm or arthritic changes may cause limitation. Normally, the lumbar lordosis reverses itself. *Level of bend and Trunk deviation:* Splinting, lateral deviation, or rotation indicate real pathology. *Painful:* Note location of pain: lumbosacral, gluteal or sciatic. (b) Lateral Bends; Right and Left: *Limitation:* Record degree of limitation. *Level of bend:* Splinting of a segment of the spine causes a change in the level at which bending of the spine occurs. Segmental limitation of lateral bending is frequently seen usually toward the side which is painful. Close inspection of the lumbar spine during the testing of motions is needed to detect differences which are sometimes minimal. *Pain:* This may be felt either on the side toward or away from which bending takes place. The significance of this difference is not known. Pain on the side toward which bending is done suggests nerve root pressure due to bulging of a traumatized swollen disk or apophyseal joint capsule, whereas pain on opposite side is probably due to muscle and ligamentous injury or muscle spasm. (c) Backward Bend: Normally this increases the lumbar lordosis, but in the acute back it does not. *Pain:* In the lame back this usually causes back pain. Leg pain on backward bending strongly suggests a ruptured disk.

(C) Sitting on Stool or Edge of Examining Table: Limitation of Motions: Compare to standing motions. Both hamstrings and sciatic nerve are relaxed in this position. Authorities vary as to the importance of sitting motions in the back examinations. In the acute back injury there is usually little difference between motions of the spine standing and sitting.

(D) Knee Extension in Sitting Position: Limitation: This should be compared with the straight leg raising test with the patient supine. Note if it is associated with back or leg pain. This is a good check on the limitation of straight leg raising. A marked discrepancy between the two suggests a functional element or malingering.

Palpation

(A) TENDERNESS: Start away from the area of complaints. This gives an idea of the man's threshold to pain. Recheck tender areas for variation during examination. (a) Location: Spinous processes, lumbosacral junction, paravertebral regions, iliac crests, sacro-iliac ligaments, gluteal regions, greater trochanters, sciatic nerves. (b) Value of This in Locating Pathology: This is often misleading. Steindler's trigger points and procaine test are of interest. They are not used by men on the panel.

(B) *Tender Lipomata or Fat Herniations:* (a) Location: These are usually found just lateral to the iliac origin of the sacro spinalis, just below the iliac crest in the gluteal region and at the sacro-iliac junction at the attachment of the deep fascia. (b) Significance: Rarely they do cause symptoms, and removal leads to cure. This can be anticipated only if they are exquisitely tender and injection with procaine causes temporary complete relief of symptoms. Non-tender fatty masses of no significance are frequently found. Those that produce symptoms are thought to be herniated through the deep fascia and have a pedicle with a neuro-vascular bundle in it. Traction on this, produced by motion, appears to be responsible for symptoms of pain and sciatica.

(C) *Muscle Spasm:* This may be almost constant or present only on movement. It is seen in either one or both erector spinae masses, typically. On lateral bending test the spasm is on convex side in traumatic afflictions since it is protective, while in rheumatoid arthritis, it appears on the concave side as the patient tries to bend his stiff spine.

(D) *Percussion:* In lesions with true nerve root irritation percussion over the spinous process at the level of the lesion may produce radiating leg pain. This may be quite painful and should be done at the end of the examination.

Hip Motions

(A) LIMITATION: With low back disability some limitation of hip motion may occur as a manifestation of the generalized guarding of all motions. This is readily distinguished from hip pathology as a rule.

(B) *Pain:* Occasionally, especially if there is nerve root irritation, hip motions may be painful in low back lesions, especially internal rotation in flexion. This is probably due to piriformis spasm and pressure on the sciatic nerve from tightening of the external rotators of the hip.

(C) *Muscle Spasm or Guarding About Hip Joint:* This suggests hip pathology.

(D) *Possible Confusion Between Hip and Low Back Pathology:* Such lesions as an acute bursitis of the greater trochanter may stimulate sciatica. Low back strain may be secondary to a hip flexion deformity. Examination of the back must, therefore, always include the hips.

Stigmata of Rheumatoid Arthritis

(A) DECREASED CHEST EXPANSION: This is an early sign of rheumatoid spondylitis.

(B) *Limitation of Neck Motion:* This too is likely to occur early in the development of spondylitis.

(C) *Peripheral Joint Changes:* These include thickening, tenderness, fluid, limitation of motion, and subcutaneous nodules most often found in region of the olecranon and knee joints.

Special Tests (Orthopedic)

THERE are literally hundreds of special orthopedic tests recorded in the literature. Most of them involve putting the hamstrings and sciatic nerve on the stretch, apply torsion or compression stress on the sacro-iliac joints, or testing for fascial and muscle contracture in the lumbosacral region. The use of these tests is a matter of individual preference. The following are mentioned:

(A) *Ober Test for Tight Fascia Lata.*

(B) *Ely Test for Tight Structures Anterior to the Hip.*

(C) *Pelvic Compression or Torsion Tests for Sacro-Iliac Lesions.*

(D) *Jarring on Heels:* Back or leg pain on this maneuver suggests articular or disk pathology.

Straight Leg Raising

DEGREES: Record degrees on each side. *Pain:* Note locations of pain, whether in back, gluteal region, thigh, calf or foot and toes.

Straight Leg Raising Combined with Dorsiflexion

IF AT MAXIMUM comfortable straight leg raising, forcible dorsiflexion of the foot produces pain anywhere along the course of the sciatic nerve, it is probable that there is nerve root irritation (Bragard's test).

Reflexes

THE segmental representation of the useful reflexes in low back pain are: Cremasterics—Spinal segment L_1; Abdominals—Spinal segment D_7-D_{12}; Knee Jerks—Spinal segment L_2, L_3, L_4; Ankle Jerks—Spinal segment L_5, S_1, S_2; Babinski—A dorsal response especially if associated with an ankle clonus and absent abdominals indicates a pyramidal tract lesion. Therefore, reflex changes in low back injuries may be interpreted as follows: An absent knee jerk suggests an $L_{3,4}$ disk lesion or one above this level. An absent ankle jerk suggests an L_5-S_1 lesion. However, if there is a history of previous leg pain, an absent ankle jerk may be a residual of this and therefore not significant for the present injury. There is no fairly consistent reflex change associated with an $L_{4,5}$ lesion. As a matter of fact, the relationship of the disk involved and the reflex change noted is far from exact, owing to variation in position and size of the protrusion. A lateral protrusion impinges on the root in its intervertebral frame. A medial disk may involve any or all of the lower roots.

Motor Changes

(A) ATROPHY: Check the thighs, calves, and buttocks. Atrophy of the thigh and calf can be measured. Buttock atrophy appears as a droop and loss of muscle tone. Loss of the muscle pad over the sciatic nerve may of itself produce sciatic pain in the sitting position owing to pressure on the nerve.

(B) *Weakness:* Great toe extensor weakness is frequently seen early in disk lesions and is definitely significant. Other muscles, especially in the lower leg, should also be checked.

Sensory Changes

CHECKING for hypesthesia to pin scratch is usually sufficient. More careful sensory testing is rarely indicated. Anesthesia or hyperesthesia is seen infrequently. *Dermatomes:* The distribution of sensory changes in low back injuries does not correspond exactly to the dermatomes according to most observers. However, there is considerable disagreement on this point. In general, the following holds: Sensory changes on the posterior lateral calf, lateral foot and fifth toe suggest an L_5-S_1 disc. Sensory changes more anterior and on the dorsum of foot and great toe suggest an L_4-L_5 disc.

Jugular Compression (Naffziger Test)

COMPRESSION should be maintained for a minute and a half. A blood pressure cuff about the neck at 40 mm of Hg. is recommended. Having the patient cough during the test may be used to increase intraspinal pressure further. Production of Pain and Paresthesia and Location: The increased intraspinal pressure sometimes accentuates sciatic pain where definite root irritation is found to be present.

General Physical

A COMPLETE physical examination is, of course, desirable but not often feasible. At least the following should be checked:

(A) *Temperament and General Attitude:* Psychosomatic stigmata. The patient's expression, the consistency with which points of tenderness are localized, the manner in which he responds to questioning, and the like, all serve to give the examiner at least an impression concerning the psychosomatic aspects of the case.

(B) *Hands:* Calluses and other evidences of heavy labor. Absence of these corroborates the statement that he has been disabled for a prolonged period. There have been instances where compensation has been paid for prolonged periods while the supposedly disabled employee has gone to work elsewhere.

(C) *Arterial Pulsation in Legs:* Leg pain from vascular insufficiency may resemble sciatica very closely.

(D) *Rectal Examination:* The following should be searched for: Prostatitis or carcinoma of prostate. Carcinoma of rectum. Tumor of sacrum. Coccygodynia as evidenced by tenderness to palpation and movement of the coccyx. Tenderness in sacro-iliac ligaments, levator ani and piriformis muscles.

(E) *Abdominal Palpation:* (a) Masses may be the clue to a gastro-intestinal malignancy with metastases to the spine. (b) Herniae occasionally produce back pain. (c) Kidney Pathology: either infections, tumor, or stone may be the cause of pain. (d) Pancreas: cancer of the pancreas or pancreatitis occasionally present themselves as back pain.

(G) *Lungs:* Here, too, there may be a primary tumor.

IV. X-RAY AND LABORATORY STUDIES

ROUTINE STUDIES: (A) C.B.C. (B) Urinalysis. (C) Sedimentation rate.

2. X-RAYS: (A) *Views:* (a) Routine Views that are Always Indicated: AP and lateral, lumbosacral spine. (b) *Special Views:* (1) Obliques are essential in suspected facet pathology or spondylolisthesis. (2) Stereos may be of value.

(B) *Positioning Patient for X-Rays:* (a) Importance of True Lateral: Narrowing of a disk space, retro-position and the like can only be judged with true lateral films. (b) Value of Standing Films: These show the relation of the vertebrae in the position of function and reveal accurately lateral tilting of the pelvis or curvature of the spine. (c) Flexion and Extension Films to Show Instability: Abnormal anterior-posterior mobility or tilting of one vertebra on another due to a degenerated disk or other defects are revealed by these views. (d) Lateral Bending Films: Limited motion at one interspace may indicate the location of a disk protrusion.

3. OTHER LABORATORY STUDIES, AS INDICATED: Blood uric acid—Low back pain is occasionally due to gout.

V. CLINICAL CLASSIFICATION

THE VAST majority of the low back disabilities seen in industry fall into three main symptom complexes: (1) Acute injuries with no x-ray or neurological abnormalities which usually result in but three to four weeks' disability and no tendency to recurrence. (2) Chronic or recurrent injuries, frequently associated with x-ray changes and more or less transient neurological signs, which tend to result in prolonged or recurrent disability. (3) Acute or chronic injuries with definite nerve root involvement which usually result in prolonged and recurring pain and disability. However, other conditions in the lumbosacral region may (1) produce clinical pictures identical with these although no industrial accident is involved, (2) pre-dispose the employee to back injury, or (3) prolong his disability once injury has occurred. There follows, therefore, a brief outline of these imitating, predisposing, and prolonging conditions to be considered first before dealing with the classification of the traumatic afflictions of the low back.

1. Arthritides. (a) Hypertrophic or Degenerative Arthritis (The wear and tear changes of the aging spine). These may develop acutely in the fifth decade producing symptoms. If they develop slowly they do not. Hypertrophic changes do not of themselves produce symptoms in most instances. (b) Rheumatoid Spondylitis. Involvement of the sacro-iliac joints or lumbosacral spine may produce low back pain and sciatica. Many cases of rheumatoid spondylitis have had a spinal fusion early in the course of the disease before the diagnosis becomes apparent.

2. Old Fractures with Deformity of: (a) Facets: The traumatic arthritis of the apophyseal joints, which results, may cause pain per se or the deformity may cause nerve root pressure. (b) Pedicles: Root pressure or distortion of apophyseal joints again may result here and cause pain.

3. Specific Infection of Bones or Intervertebral Disks. (a) Tuberculosis. (b) Others including pyogenic organisms, brucella, typhoid, etc.

4. Specific Infection of C.N.S. Rarely acute anterior poliomyelitis may mimic a ruptured disk with leg weakness, plus limitation of back motion and straight leg raising.

5. Metabolic Disturbances: (a) Osteoporosis. (b) Paget's disease. (c) Others, such as gout, hyperparathyroidism, etc. All these may be associated with back pain.

6. Tumors: (a) Metastatic: prostate, breast, G. I. tract, thyroid, kidney. (b) Primary: hemangioma, giant cell tumor, osteochondroma, chordoma, spinal cord tumors, osteoid osteomas.

7. Congenital Anomalies Producing Instability or Mechanical Derangement: (a) Spondylolisthesis, or pre-spondylolisthesis. (b) Facet abnormalities, asymmetrical apophyseal joints; under-developed, inadequate joints, etc. (c) Spina bifida of severe degree. Spina bifida occulta of a slight degree is not significant. (d) Others of less importance, such as lumbarized or sacralized vertebrae, large transverse process of L_5 articulating with sacrum, etc.

8. Postural Defects: (a) Faulty body mechanics: Obesity. Hyperlordosis, sagging abdomen, flat chest, protruding chin, poor trunk musculature. Hypolordosis with long thick trunk and tight fascial structures. Short leg with resultant strain on low back. (b) Faulty foot mechanics: Pronated feet. Tight heel cords.

9. Non-Traumatic Lesions which may Produce Root Pressure: (a) Enlarged epidural venous plexus. (b) Bony abnormalities. (c) Others, such as epidural cysts, etc.

10. Peripheral Lesions of the Nerves and Blood Vessels in the Lower Extremities: (a) Nerve: Peripheral neuritis, tabes, etc. Meralgia paresthetica, frequently associated with tight corset or great obesity, a traumatic neuritis of the lateral femoral cutaneous nerve probably. Other lesions of the sciatic nerve: A wide variety of conditions may simulate sciatica. An osteochondroma of the neck of the fibula may produce pressure on the common peroneal nerve. A digital neuroma in the foot (Morton's metatarsalgia) also may produce radiating leg pain. Even a Baker's cyst may cause calf pain due to nerve pressure in the popliteal space. (b) Blood vessels: Buerger's disease, arteriosclerosis, and thrombosis of the popliteal artery may cause pain simulating sciatica.

11. Referred back pain from visceral disease.

12. Psychosomatic back pain.

13. Exaggeration of symptoms for purposes of compensation.

With these factors in mind the previously mentioned three groups of low back injuries can be elaborated upon.

Acute Low Back Injuries

DEFINITION: Typically these are the employee's first injuries and result from definite trauma, most commonly a lifting strain. The pain is located in the low lumbar region; it is aggravated by any motion of the lumbar spine and relieved by rest. Leg pain, if present, is vague and transient, usually in the gluteal or thigh region. The physical findings include only painful limitation of motion, muscle spasm, at times list and scoliosis, and tenderness. There are no neurological or x-ray abnormalities. The course is of relatively short duration, usually with complete cure in about three to four weeks.

PRESUMED PATHOLOGY: (A) Muscle and Fascial Injuries. The structures injured are not known. Frequently mentioned are: (a) Sprain of erector spinae origin. (b) Sprain of gluteal muscle origins from iliac crest. (c) Other sprains and strains. (B) Joint and Ligamentous Injuries. (Most of these injuries probably produce prolonged disability and should not be placed under this heading.) (a) Sprain lumbosacral articulations, the most common location. (b) Sprain other articulations of lumbar spine. (c) Sprain sacro-iliac joint, probably exceedingly rare. (d) Other sprains or strains, such as sprains or ruptures of the interspinous ligaments in falls or flexion injuries or of the anterior longitudinal ligaments in hyperextension injuries. A spinous process may even be avulsed. In the clay shoveler's syndrome, this occurs at the cervico-dorsal junction. Lifting injuries probably produce sprains of the interspinous ligaments in the low back. (C) Intervertebral Disk Injuries. (Most of these injuries probably produce prolonged disability and should not be placed under this heading.) Differentiation of these from the muscle and fascial injuries in the acute phase is still impossible as a rule. The subsequent course with the lapse of time usually clarifies the situation. The

disk injury has a longer convalescence, is prone to recur, and in a certain percentage of cases sooner or later goes on to produce nerve root compression due to protrusion posteriorly. The injury may be one of the following: (a) Tear of the annulus fibrosis without rupture of the nucleus pulposus, which gradually heals by scar. (b) Tear of the annulus with rupture of the nucleus but not nerve root pressure. The rupture may be anterior, lateral, through one of the cartilage plates or even posteriorly but so placed as not to compress a root.

Chronic or Recurrent Low Back Injuries

DEFINITION: Characteristically, these employees have had previous back injuries, often several. The precipitating trauma may be of the common lifting type or may be insignificant, an unguarded movement of the back. The pain and physical findings do not differ from those in the acute injuries nor do the neurological findings. The x-rays, however, often do show some contributory pathology as, for example, a congenital anomaly. The course is either prolonged (several months) or towards frequent recurrences, often with less and less definite trauma.

PRESUMED PATHOLOGY: (A) Muscle and Fascial: (a) Chronic strain or tear of iliolumbar fascia. It is questionable if such lesions actually exist or produce symptoms. (b) Lumbar "myofascitis" or fibrositis. This is an ill-defined entity. It may represent a manifestation of the group of collogen diseases including rheumatic fever, rheumatoid arthritis and others, or a rapidly developing generalized collogen degeneration in an individual undergoing premature aging. It is seldom seen in industrial low back cases. (c) Herniations of sub fascial fat. Very rarely a patient's sciatica may be due to this. (d) Other chronic strains or sprains. (B) Joint and Ligamentous Injuries: (a) Sprain of lumbosacral or other lumbar articulation due to instability: (1) Congenital instability: Pre-spondylolisthesis or spondylolisthesis. Severe spina bifida. Asymmetrical or otherwise inadequate facets. Others. (2) Acquired instability: Degenerated disk, usually the rapidly developing localized form. (b) Postural strain of lumbosacral spine, usually the lumbosacral junction: Here habitual use of the spine in a position of near maximum extension predisposes to chronic and recurrent strain presumably due to further extension beyond the physiological limit. The physiological limit of motion appears to vary widely so that individuals with the same posture may differ greatly in their susceptibility to strain. (c) Mechanical derangements of lumbosacral spine. (1) Old compression fractures with wedging of the bodies and consequent subluxation of the apophyseal joints. (2) Old fractures of the facets or pedicles deforming the apophyseal joints. (3) Recurrent subluxation of the apophyseal joints, the "facet syndrome" of Ghormley. (4) Hypertrophic arthritis and disk degeneration. As this process reduces the range of back motion of the spine it may increase susceptibility to sprain. (d) Intervertebral Disk: The degenerated or traumatized disk, as indicated above, predisposes to ligamentous strain. It may permit abnormal sliding or tilting of one vertebra on another or narrowing of the interspace due to loss of turgor with distortion of the apophyseal joints, or paradoxically, during a later phase of its development, it may increase susceptibility to strain by the loss of over-all spine motion associated with the degenerative changes throughout the spine. Finally if protrusion of disk material occurs posteriorly it may produce root pressure with sciatica and neurological changes as outlined in the next section.

Low Back Injury with Nerve Root Involvement

DEFINITION: Commonly here, too, the employee usually has had previous back disability. The present precipitating trauma may be severe or minimal. The back pain is in the lumbosacral region, but not uncommonly it tends to be minimized or disappear, the leg pain, of more or less dermatome distribution, tending to predominate. The leg pain is frequently associated with paresthesias, is relieved by moving about or certain positions, and is aggravated by anything that puts traction on the nerve root (Lasegue test), or increases the intra-spinal pressure (coughing, straining, etc.). Physical findings include not only flattening of the lumbar spine, muscle spasm, list and scoliosis, but also neurological findings of greater or lesser degree, including atrophy, weakness, sensory and reflex changes. The x-ray may show a narrow space but frequently shows nothing. The course is toward slow recovery with tendency to recurrence, but the disability is prolonged and surgical treatment is frequently indicated.

PRESUMED PATHOLOGY: (A) Spinal Canal: Protruding or ruptured disk. Thickened ligamentum flavum. Epidural adhesions. Old fractured pedicle. (B) Intervertebral Foramen: Lateral disk rupture or protrusion. Hypertrophic arthritic changes in facets. Old fractures of the facets. Spondylolisthesis (posterior pressure). (C) Intra Dural Space: Chronic arachnoiditis. Post-traumatic scarring of cord and roots.

VI. TREATMENT

GENERAL PRINCIPLES: (A) Conservative treatment should always be tried first unless there is marked root involvement with muscle weakness which demands early root decompression to prevent permanent paralysis. A myelogram should not be done until conservative measures have failed and the patient is ready for surgery.

(B) As a rule patients in the 5th decade or older are best treated conservatively.

(C) Repeated attacks of low back disability, if adequate conservative treatment has been tried, indicate surgical treatment.

(D) No treatment, least of all surgical, is of much avail in cases where legal settlement is pending.

(E) Belts or braces must be adequate, otherwise they are useless. In general they are temporary measures to get relief from the acute symptoms. Attempts must then be made to improve musculature and body mechanics so that support may be discontinued gradually. The narrow sacroiliac type of belt is usually of no value. The apparatus should be either the lumbosacral type of corset or a brace.

(F) Examination of the patient should be gentle but thorough as soon as his condition permits. In the severe, very acute cases, two or three days complete bed rest may be indicated before the examination is completed. A thorough examination

followed by some explanation to the patient of his injury is a very important part of his treatment. In this way he understands the problem and feels that a real effort is being made in his behalf. Too often the examining physician puts the sufferer through a few maneuvers and starts "routine back care," often with daily trips for diathermy. The patient with a mild injury does well enough on this regimen but the severely injured does not. The physician must strive to recognize the latter case by his careful examination so that proper treatment is started. Such cases must be psychologically prepared for their prolonged convalescence, lest they become discouraged and antagonistic, with the stage set for chronic invalidism and compensation seeking.

(G) An adequate follow-up on the progress of the patient with a back injury is important. This must not be excessive making the patient believe he is worse than he is, nor so superficial that he feels he is not being cared for. Two or three office visits a week for diathermy for a prolonged period of time are excessive and of very little value. The frequency of visits must depend on the case. If acute he should be seen quite frequently but not required to make many office visits. He should be at rest, if not in a hospital, then at home. If chronic, visits can be spaced at first weekly, then every second week, and then even monthly as the exercises are learned and progress becomes satisfactory.

TREATMENT OF ACUTE INJURIES: (A) Bed rest: All members of the panel agreed that bed rest on a firm mattress was the most important first step in treatment. This should be carried out in a hospital if possible since this is vastly more efficient than rest at home. The period of rest advocated ranged from two days in the mild to two or three weeks in the severe injuries. Any comfortable position is admissible including side lying with a pillow between the knees, supine with two pillows under the knees, and prone with a pillow under the stomach.

(B) Traction: In the acute cases this was not recommended by members of the panel.

(C) Local heat: This was used by all. T. C. T. preferred hot wet bath. Diathermy was not considered of particular advantage, and the trips to and from the office or clinic for this were considered harmful.

(D) Medication: All agreed that sufficient medication should be given to get the patient comfortable as soon as possible.

(E) Support: Strapping was considered by all to have its place in the treatment of the acute back. However, it must be adequate, extending well anteriorly and from the lower thorax down over the buttocks. Great care in its application is needed to avoid skin breakdown. J. S. B. felt that a belt was only occasionally indicated in a first injury. J. H. S. advocated a belt if the injury was severe. No one advocated a body cast. A belt if used should be of the backlace lumbosacral type, well fitting and preferably with reinforcing steels. The narrow sacro-iliac type of belt is of little value. The danger of labelling the patients as chronic invalids by overuse of belts or braces was stressed.

It is the doctor's responsibility to see that these are discontinued.

(F) Exercises: These were advocated after the subsidence of acute symptoms. An exercise program considered satisfactory: In the acute phase, exercises for the arms and legs, that do not cause back discomfort, serve to preserve muscle tone and hasten rehabilitation later.

(G) Other measures: No panel member favored manipulation or procaine injection.

(H) Intravenous tolserol: This has not been used sufficiently by panel members for any conclusions to be offered.

(I) Return to work: This is allowed when the back motions are normal and there is no spasm or pain.

Treatment of Chronic and Recurrent Cases

MANY different specific conditions may cause this syndrome. The treatment, of course, varies with the pathology.

(A) *Chronic Muscle and Fascial Injuries:* It was considered doubtful if these injuries per se produce this syndrome. In the rare case presenting the picture of a pedicled lipoma with tenderness and sciatic pain, associated with a palpable mass, a therapeutic test with procaine followed by excision is justifiable.

(B) *Joint and Ligamentous Injuries:* (1) Spondylolisthesis: In general a trial of conservative treatment with a brace or reinforced corset was recommended, followed by surgery, if symptoms are not relieved. J. H. S. advocated bed rest for at least three weeks, supplemented with traction if there was leg pain, and then a brace. If surgical treatment is indicated, fusion should extend from the 4th lumbar to the sacrum. In the presence of leg pain the nerve roots should be decompressed at the time of fusion. J. S. B. advocated a four to six months' trial of conservative treatment before surgery and stated that in his experience there was no correlation of symptoms with the degree of slip and that, once injured, patients with this anomaly seldom get back to heavy work. C. E. A. favored fusion early if symptoms were persistent. (2) Facet Anomalies or Severe Spina Bifida: Here, too, the same general plan as for spondylolisthesis was followed.

Surgical treatment is indicated in extreme cases only when other measures fail.

Disk Degeneration without Neurological Changes

IF CHANGES are generalized and many interspaces are involved, only conservative treatment is indicated or feasible. This includes an adequate corset or brace, rest and limitation of activities, weight reduction if indicated, and, as stressed by J.H.S., consideration of a change to a lighter type of work. An exercise program is initiated after the subsidence of symptoms. Ordinarily, the pain due to degenerated disks subsides as the spaces become stabilized by the development of hypertrophic spurs which eventually tend to bridge the interspace completely. In localized disk degeneration surgical treatment may be indicated with exploration and fusion. If root irritation develops due to protrusion of degenerated disk material then exploration with or without fusion usually is necessary. In general the panel favored conservative treatment. It was felt that eventually these patients could be weaned away from the supports after subsidence of symptoms although an occasional case has to wear a support indefinitely.

Chronic Strain Due to Postural Fault

THERE was general agreement here that treatment should consist of rest, in bed if severe, a support, and then suitable exercises followed by the gradual elimination of the supportive apparatus after improvement of posture and musculature. Weight reduction is indicated in the obese. C. A. E. favored either a Taylor or pelvic "butterfly" type of brace; J. S. B. a corset with reinforcing steels, and T. C. T. a "butterfly" or pelvic brace for the stiff straight back and a Goldthwait brace for a lordotic patient with chronic strains. The patient must, of course, avoid activities that cause discomfort. A firm mattress and bed that doesn't sag are also helpful. Bed boards are not necessary, particularly if they make the patient uncomfortable. Eventually the back support can usually be discarded but not invariably.

Mechanical Derangement of the Apophyseal Joints

HERE, too, an attempt is made to get relief by suitable support followed by exercises and improvement in posture. If this fails after an adequate trial, spinal fusion is indicated to immobilize the affected joints. Hypertrophic or degenerative arthritis if generalized, of course, necessitates conservative treatment and almost invariably responds to this, though a change to a less arduous type of labor may be necessary.

Low Back Injuries with Nerve Root Involvement

THESE represent but a small percentage of the industrial back injuries in spite of the voluminous literature. Treatment should include a trial of conservative measures as outlined above in all cases except where there is marked motor weakness or sphincter disturbances when, of course, early decompression is mandatory to prevent permanent neurological damage. When conservative measures fail, hospitalization, myelogram, and operative decompression were advocated. The question of whether to fuse was not discussed.

Back Exercises

GENERAL PRINCIPLES: (1) The purpose of these exercises is to improve the mechanics of the back by developing better coordination and strength of the trunk musculature and stretching tight structures and contractures that may be contributing to the faulty posture.

2. Weakness or poor coordination of the abdominals, gluteals, and back muscles deprives the spine of its essential supporting mechanism, not to mention the other effects of poor posture. Under such circumstances the strained back either remains symptomatic or is subject to recurrent injuries.

3. Exercises must be prescribed according to the condition of the patient. Almost without exception they do harm if they cause pain. Progressive exercises are instituted somewhat as follows: (A) In the acutely painful stage while the patient is on bed rest, he should do no back exercises but muscle settings for the muscles of his extremities to try to preserve their tone and strength. For example quadriceps setting, toe curling, ankle inversion and eversion and the like are usually tolerated. (B) As soon as they can be done without pain, recumbent abdominal and gluteal setting exercises may be started gradually. (C) As pain and spasm subside active exercises can be started. They include pelvic tilting with abdominal and gluteal muscles, single straight leg raising, back extension, etc. (D) Finally stretching exercises for tight hamstrings, fascia lata, lumbar fascia and heel cords may be started as indicated.

4. Persuading the patient to carry out an exercise program effectively is not easy. The doctor must devote enough time to explain the purpose of the program in a fashion convincing to the particular patient. Then with or without the help of a physiotherapist be sure the patient knows how to do the exercises correctly and finally check him frequently enough to be sure he continues to do them.

5. A great many different exercises have been developed. Only one of each general type is given here.

ACTIVE EXERCISES: (1) Recumbent: (A) Supine: (1) Breathing exercise: Hands at back of neck—chin in—back flat—breathe deep, raising chest—hold chest up and exhale slowly by drawing lower abdomen in and up. This is a gentle exercise which can be started early. It serves to improve general posture and improve coordination of the abdominals and diaphragm. (2) Abdominal setting and pelvic tilting: Knees bent—flatten back against floor by pulling abdominal muscles *in* and *up* and tipping pelvis slightly, thereby flattening the lower spine. Breathe normally while doing this. Somewhat more vigorous than (1), this can also be started quite early. (3) Single straight leg raising: Bend one knee and hip—raise other leg straight about 30° and lower slowly keeping back flat and abdominal muscles pulled in and up throughout the maneuver. Repeat with other leg. This is also an abdominal exercise bringing the hip flexor and knee extensor into play. It likewise is tolerated relatively early. (4) Trunk flexion for upper abdominals: Hands on chest or behind neck—raise head and shoulders three to six inches—hold and relax. This is quite vigorous and is not tolerated until pain has more or less subsided.

(B) Prone: (1) Gluteal setting: Squeeze buttock muscles—hold—relax. This may be painful during the early convalescence and must be deferred until it does not cause pain. (2) Back extension and shoulder retraction: Grasp wrist with other hand behind back—pull down hard—raise shoulders and chest—hold—relax. This cannot be done early as a rule, for it is often painful.

(C) Standing: (1) Back flattening against wall: Back to wall—heels six to eight inches from wall—flatten spine against wall by tilting hips backward—abdomen in and up—chest up—chin in and down—occiput up. Try to maintain this position when walking away from wall for a few minutes. This is simple to do, once mastered, and can be done on the job during the day. It is usually not painful even quite early in convalescence and patients are more likely to do this than the recumbent ones.

STRETCHING EXERCISES: (1) Recumbent: (A) Supine: Grasp both flexed knees with both hands and gently pull toward chest. Increase amount as tolerated. Start with three times and gradually increase to 10 times twice daily. This is used where there is hyperlordosis and tightness of the lumbar fascia. It should be started late in convalescence and done cautiously.

(B) Prone: Bend knee and grasp heel with hand. Pull heel toward buttock. Alternate legs. Increase amount of pull and the number done per day grad-

ually. This is used to stretch anterior fascia as evidenced by a forward rotated pelvis and a positive Ely test.

2. Standing: (A) Hamstring stretching: Stand on left leg—right heel on stool, knees straight, foot dorsiflexed—try to touch right toes with left hand, bending at hips keeping back straight—repeat with left heel on stool—do five to 10 times each side. This is indicated where the hamstrings are tight and after the acute symptoms have subsided.

(B) Stretching fascia lata: Stand right side to wall with right hand on wall at shoulder height—bend left knee and sag hips toward wall, keeping upper body erect and making right hip prominent. Hold 10 seconds. Repeat with left side to wall. Do each five to 10 times twice daily. This is indicated in the presence of a positive Ober test and, like other stretching exercises, is deferred until acute symptoms have decreased.

(C) Heel cord stretching: Face wall—feet about 18 inches from wall, toeing in slightly weight on outer borders of feet—hands on wall. Fall toward wall keeping back flat, hips extended and heels on floor. Hold 10 counts. Repeat five to 10 times twice daily.

EXAMINATION FORM

LOW BACK PAIN—HISTORY

NAME Age
Ht.
Wt.
Occupation
Employed by: Referred by:
C. C.: Date Inj.
Present History: Date Exam.
Onset and Progress
Back Pain (location)
Aggravated by:
(bending, lifting, activity, rest)
Relieved by:
(support, heat, activity, rest)

Leg Pain (location, character)
Aggravated by:
(coughing, sitting, bending, prone lying)
Relieved by:
(bed rest, back support, side lying, hip flexion)

TREATMENT RECEIVED

PRESENT STATUS
(working, able to sleep)

PAST HISTORY—BACK OR LEG PAIN

SYSTEM REVIEW
ENT.
C. R.
G. I.
G. U.
X-RAY (type of films taken):

LABORATORY DATA

DIAGNOSIS:

TREATMENT RECOMMENDED:

BACK EXAMINATION

INSPECTION

Gait	Normal	Protective			
Activity	Normal	Protective			
Posture	Excellent	Good	Poor	Very Poor	
Musculature	Average	Good	Poor		
Chest Expansion	Normal	Limited			
List	None Right	Left	Towards Leg Pain	Away from Leg Pain	
Pelvic Tilt	None Right	Left	Heel Raised to balance:		
Scoliosis	None Type-				
Lumbar Lordosis	None	Increased	Flattened		

BACK MOTIONS STANDING

Forward Bend:	Finger Tips from floor (inches)			
	Spine Deviation —	None	Right	Left
	Lumbar Curve Reversal		Yes	No
	Pain —			
Backward Bend:	Increases Lumbar Lordosis		Yes	No
	Pain —			
Lateral Bend				
Right	°; Normal—	Level of Bend—		
Left	°; Normal—	Level of Bend—		
	Pain			

EXTREMITIES

Hip Motion—	Normal	Limited—	
Leg Lengths—	Equal	Difference—	
Feet—	Normal	Abnormal—	
Circulation—			

NEUROLOGICAL

Reflexes			Babinski		
Hypesthesia	None	Chart on diagram—			
Atrophy (inches)	None	Thigh—	Calf—	Buttock—	
Jugular Compr.	Neg	Leg Pain			
Weakness	None	Muscles: Gr. Toe ext.—	other—		

PALPATION

Tenderness	None	Chart location and severity
Erector Spinae Spasm	None	Location and degree—

SPECIAL TESTS

Straight Leg Raising—	Right—	Left—	Pain—
Straight Leg Raising with foot dorsiflexed	Right—	Left—	Pain—
	Normal	Exaggerated	Pain—
Heel-Toe Walking	Normal	Incr. Back Pain	Incr. Leg Pain
Knee Extension (Sitting)	Limited	Left—	Pain—
	Right—		
Other Test			

OTHER
TEMPERAMENT Average Hypersensitive Phlegmatic
REMARKS:

A Rest Regime for the Acute Back Strain

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ABOUT 1938, one of us (C.L.) became concerned over the problem of the "acute back" cases and the variety of diagnoses, interpretations, and treatments prescribed by different orthopedists to whom the same cases might be referred. In an abstract way, the impression was obtained that "over-diagnosis and over-treatment" were complicating the problem. At this time, he had the opportunity of hearing Dr. Arthur Steindler discuss the tentative conclusions he had reached, in a current effort to re-evaluate the problem of the "acute back." There was much in Dr. Steindler's discussion which this author, not being an orthopedist, could not follow—but he could follow and understand the description of the lumbar musculature which received an acute strain, and which required rest to allow recovery, as would a muscle in any other part of the body; also, if this rest were carried out for a sufficient length of time to allow complete recovery of the muscle, the symptoms would not recur until it again was subjected to a similar strain.

Dr. Steindler's paper inspired the author to study the methods by which a patient with an acute back strain could be induced to rest his back—and his explorations led him to the development of a therapeutic regimen which will be described here. In addition some results will be presented and also some comments as to why we believe the method is effective.

In keeping with the concepts of industrial medicine, there will be offered also a short summary of the information which we believe should be disseminated throughout industry—and which, if followed, will prevent many back strains. We believe that the regimen is not only satisfactory for treatment of the acute back strain, but is, in itself, a therapeutic test as to whether the condition is actually a strain, or another lesion. Any unexplained variation in the course may be of diagnostic import to the etiology.

To begin with, the authors believe that a strain of back muscles is a frequent occurrence, and that the acute onset of pain in the back, with muscle spasm and limitation of motion, in an employee who gives a history of pain while lifting—particularly while in an awkward position or following heavy or awkward work within less than 24 hours, may safely and tentatively be diagnosed as an acute strain, and safely treated as such for a period of 10 days to three weeks. It is to be noted that cases of direct violence are excluded from this series, and that the therapy, as it will be outlined, is not applicable to such cases of direct trauma, nor should it be used.

Careful history-taking will in a great number of cases reveal that one of these three fundamental rules of lifting has been violated:

1. Keep the load close to the body.
2. Always face the load.
3. Begin to lift slowly—do not jerk.

Most of us are familiar with the one admonition which has been universal to the country with regard to lifting, and that is to flex the legs and keep the back straight. This procedure of somewhat questionable practicability is followed automatically in a modified and practical fashion if the first rule is obeyed, of keeping the load close to the body, since this automatically obviates the necessity for leaning far forward to reach the load. More back strains, however, seem to occur through violation of the second rule. It seems to be instinctive when men put a load down to one side, that they keep their feet in a fixed position, rotate the body, and lean over sidewise to drop the load. This places the body under torsion and relaxes the one side, placing the muscle fibres of the other under stretch and torsion, and it is at this point that the strain is most likely to be incurred. If the pivoting is done by moving the feet, and the load is dropped or placed by forward bending, particularly if combined with some squatting, the risk of strain is minimized. The third injunction applies to "getting the heft" of the load before lifting, since if it is heavier than anticipated or is "stuck," a strain is likely to result.

In the history-taking, we have found it beneficial to demonstrate the correct and incorrect method of lifting, and have in many cases received the confirmation of the patient as to our explanation of how he incurred his injury, and have been promised his cooperation in "planting" the idea and concepts of lifting among his fellows.

Early in our therapeutic trial, it was found that the general injunction to "rest," or "take it easy," without a detailed description of what was expected and why, was ineffectual. We therefore developed a type of detailed interview, with specific instructions. Among the other benefits of this type of interview has been the result that the regime is looked upon by the

Presented at the Ninth Annual Meeting of the WESTERN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, San Francisco, June 25, 1950.

employee as a positive program, rather than as a negative period of neglect.

No two interviews are identical, for the educational and occupational level of the person have to be considered, and his understanding and grasp of the situation also appraised. Some points will be grasped quickly by some persons, but must be elaborated upon for others. All main points are contained in the following sample interview:

"This is apparently due to a strained muscle in your back. If so, it will respond well to treatment, provided you do your part in assisting it. There are three things that will help you: (a) medication; (b) heat; (c) rest.

"The medicine consists of this tin of ointment (a salicylate ointment) and these tablets (a package of acetylsalicylic acid compound tablets), and we will lend you an electric pad, in case you do not have one at home. Rub a piece of the ointment, about the size of your thumbnail, on your back, and cover it with a T-shirt or pajamas, as it is sticky—and then apply the electric pad for comfort. Do not go to sleep with the pad on 'high,' as it may burn your skin. Also take one of the tablets every three or four hours, according to your needs for comfort. This medication and heat will make you more comfortable—but the most important part of the treatment is REST. Your back hurts you now every time you move because it is the muscle's way of telling you, 'Don't do that to me—I am not ready yet—let me rest.' You may feel that you can 'work this out,' but it will not pay you to. If you respect the muscle's desire to rest, it will save you much time in the long run—as you could 'warm it up and keep working,' but it will last much longer, and in the end may cost you a greater loss of time.

"If you will respect the back now and keep your movements to an absolute minimum, you will be comfortable much sooner, and probably within a matter of two or three days. It may be that tomorrow morning it will be worse even than it is now—but if you will lie quietly, making no movement which you can avoid, you may expect to be over the worst of it in a day or two.

"The pain in a strained muscle in the back develops rapidly, but subsides slowly. It may be from seven to 21 days before it has entirely disappeared and you can make all or any movements without pain. In the meantime, keep your movements under the point of pain. That means that you will be able to do much more in a few days than you can do today, and each period of a few days should see you able to increase your activity without pain. It is important that you keep your movements under this ceiling of pain.

"It is impossible to lie in bed without moving, but you should minimize these movements, and if the mattress and springs are saggy in the middle, put table leaves or fence boards under them, to keep them as straight as possible. This will prevent you from 'jack-knifing' your back each time you turn in bed, and will allow you to turn with a minimum of bending.

"You will be quite uncomfortable. This pain is severe now, and it may remain so for a few days. To minimize your discomfort, put the radio within reach of your bed, supply yourself with cigarettes or cigars, stock up on whatever funny books or detective stories you read, and prepare yourself to stay in bed for several days, at least.

"Have your family bring your meals to you as long as you cannot get out of bed without discomfort. You work for them all year, and it will not hurt them to wait on you for a few days. Do not get dressed to come to see me, for at least one week. Communicate with me by telephone if it is not beginning to improve in 48 hours or if you are in very severe distress. The main thing is the rest, and you cannot get dressed and come to my office, wait in the waiting room, and get up and down to sit in my office chair, without interfering with this rest. Therefore, it is more important for you to stay home and lie quietly, rather than make the movements that cause pain from trying to come to see me.

"The same thing about taking x-rays. The muscle will not show in the x-rays, and the drive to the radiologist, and the position to which you will have to twist on the table, etc., will only increase your discomfort.

"If, within 10 days or two weeks, you are not much more comfortable than you are now, and have not been improving according to the pattern I have drawn, we can arrange at that time for x-rays and further examinations if such are necessary. We cannot tell at this time how long you will be disabled, but we do know that it is practically impossible to say that at one particular hour, or one particular day, you suddenly will be well. If, therefore, we make a mistake in estimating the time at which you return to work, let us make it on the side of safety by having you stay out too long rather than going back to work too soon. If you use your back too soon, and cause a recurrence of pain, you will have to repeat the process of rest. It is like walking on a freshly-painted kitchen floor. If you walk on it too soon, you will have to paint the floor over again. If you wait longer, the paint is all the harder, and you have done no harm. Therefore, do not be too enthusiastic about returning to work too soon; and be willing to stay out until you conscientiously can state that all your pain on motion has left."

THE objectives of this talk are manifold. They include: (a) An understanding on the part of the patient as to the reasons for rest, and the methods by which he must obtain it. (b) An understanding that this is a positive program of rest, and not purely a negative injunction. (c) An assurance that he may expect a complete recovery in a reasonable time. (d) An assurance that he has no deep-seated injury which requires immediate x-ray studies for diagnosis, or elaborate manipulations or treatment. (e) An emphasis that manipulations, as well as motions, are undesirable, minimizing, if not eradicating, the frequent desire for manipulations which are of dubious value, if not positively harmful. (f) A dramatically drawn diagram against which he can measure his own course of progress. (g) A willingness to remain at home and be isolated from the infectious prophesies of serious and permanent disability, and

expectations of enormous compensation, to which he may be exposed in hospitals or waiting rooms. (h) Finally, and possibly most important, the assurance that his discomfort and his treatment are the most important part of the condition, and that he is not threatened with a dispute, or a verbal or legal battle at this time over responsibility. If the back fails to respond to the therapeutic test of rest, the cause will be gone into further and faced, and he is protected until, and unless, time confronts us with a different situation.

The second author (H.W.) wishes to emphasize that all patients had histories of injuries, or histories of heavy or awkward lifting less than 24 hours before the onset of pain. While the importance of the history is stressed, the physical findings have also proved of value. All of these patients had objective findings that could be observed in the usual routine examination, according to standard practices, which were limitation of motion, muscle spasm, tenderness or guarding, or a combination of any of these.

We question the popular belief that claiming a back strain is a guaranteed method of obtaining time off with compensation or sick benefit pay. Adequate physical examination, in our experience, will uncover an objective finding in any disabling strain, and we frequently have been confronted with the problem of convincing the patients that they should remain away from work in order to care for their backs. A claim of disability due to back strain in which physical signs are entirely lacking constitutes a challenge for exploration in both the somatic and the psychic areas. One such case was encountered by us in our study, and the psychodynamics which were revealed were interesting from a sociological point of view with regard to compensation versus unemployment, but the details are not pertinent here.

Critical observation of this described method of treatment for low back strains during the past two years has raised doubts from time to time as to its merits, which doubts will occur also to the reader. The fact that there might be a fracture, a dislocation, a herniated intervertebral disk, acute arthritis, or malignancy, or another involvement of the spinal cord, was taken into consideration, and we occasionally feared that we might possibly do the patient harm by waiting for a more accurate diagnosis. Prolonged observation and experience, however, have convinced us that these objections, or complications of treatment, whichever one chooses to call them, have not been valid in this series, and after careful consideration we fail to see that any harm can result from a few days of bed rest. If the patient developed fever or pain severe enough not to be controlled by acetylsalicylic acid, he was instructed to communicate with us immediately by telephone, in order that further investigation or treatment could be initiated.

Thirty-six cases were treated by this method, with loss of time ranging from one day to a maximum of 54 days. Ages varied from 23, the youngest, to 64, the oldest. In the older age group, some known arthritics were in the series. The average loss of time was 14 1/9 days. This time loss, we believe, compares favorably with that to be expected from any other accepted form of treatment.

We believe, however, that the favorable experience in length of disability is not necessarily the outstanding advantage of this type of treatment. We desire to point to the following other important considerations:

1. There were no industrial relations disputes with subsequent sequelae and resentments.
2. There were no cases to appear before the Industrial Accident Commission for settlement.
3. All the patients returned to their original jobs, and no jobs of light work had been created for them.
4. There were no major complications.
5. There were no cases that required surgical intervention.
6. There were no total or partial permanent disabilities.
7. The savings on hospitalization, x-ray studies, laboratory examinations, consultations, etc., are obvious.

For those interested in testing this method, we urge that they do not undertake to do so unless their initial confidence in it is sufficient to convey confidence to the patient. We feel it is necessary that a sense of security be transmitted to the patient to allow him to follow the regimen conscientiously, and cooperate with the physician. This sense of confidence must be obtained from the physician, and in view of the psychiatric axiom that "feelings cut through words," we believe that confidence in the method on the part of the therapist is essential.

Discussion

A. STEINDLER, M.D., Iowa City, Iowa: DRS. LEGGO and WALKER in their interesting paper have stated the situation so precisely that I have no difficulty in discussing it, knowing to what concrete point or points to direct my remarks. They have, above all, made it clear that they are not concerned with what may be called the traumatic low backache in the stricter sense, such as occurs by direct injuries to the lower back, but rather the occupational type such as occurs by indirect strain in the course of ordinary work and under what one might consider an ordinary occupational hazard.

In treating this subject, they make two distinct points. The first pertains to prophylaxis, and the second to first aid, so to speak, for the injured back, by enforced rest. I think they did well to point out that many sore backs are the result of improperly or clumsily and—from the viewpoint of efficiency and energy consumption, expensively—carrying out the daily work at the machine or loading platform. The athletic trainer can tell precisely how to lift a weight, and a description of the technique is to be found in any textbook on

field athletics. It goes without saying that the novice should be shown the way of performing his manual task with the least expenditure of energy per kgm. of work and therefore with the greatest amount of efficiency and producing capacity. It is, in the last analysis, the job of the time and motion people to take care of this rationalization of work, and it must be based on physiological experimentation rather than the time-honored trial and error methods. A good foreman can do a lot to instruct his workers in that direction, to find the optimum of lifting height, loading weight, stance, etc., but the physiological laboratory which determines accurately the energy consumption under an especially standardized condition can give the precise answer. An example is the speed optimum and load optimum in military marches under particular restraining specifications. The occupational low back is, many times, the victim of unrecognized or disregarded conditions for optimal work.

The second cardinal point concerns what one may call "first aid" to the back strained in occupational hazards—enforcement of rest. Obviously, the strain is a clinical entity, involving ligamentous structures, aponeuroses and muscle tissue. We know the pathological process occurring in each of these structures. We know the sequence in which the structures are strained, in turn, under certain insufficiently safeguarded movement; and we know the reaction of these tissues to mechanical injury, the conditions under which repair is accomplished, and the limitations of spontaneous reparability. We are certain that acutely strained ligamentous structures require rest and immobilization for repair, and that muscle injuries require, first, rest and immobilization, and later, in the state of spastic reaction, physiotherapy, or even stretching.

Why, then, this confusion and discrepancy among orthopedists and others? Why must the patient always be immobilized? Why must he always be mobilized and stretched? Why must he always be treated conservatively? Why must he always be operated? I can tell you why you meet so often with the "always" and the "never" man, the magisterial tycoon of the profession. It is because it is so much easier to trot along on a preconceived route of procedure than to make a detailed analysis of the situation in the individual case on the spot and in all its subsequent stages.

We all can agree with DRS. LEGGO and WALKER that the most important factor in the acute low back strain is rest. But what does rest imply? Recumbency, certainly; but also immobilization, strapping, support—and it also implies such medication as DRS. LEGGO and WALKER indicate, which will make the patient comfortable and keep him from moving around; then, careful ambulation, still under some back support.

So far as the acute back is concerned, I agree essentially with this. But what of the subsequent attacks, the repetitive case, and the lingering backache? Why do some backs strain so easily and so repeatedly? There are three points to consider—and all of them are to be brought out by careful historical examination:

1. The anatomical make-up; anatomical variations—particularly sprain, spasm, clefts, spondylolisthesis.

2. Pre-existing pathology or senescent conditions, such as degenerative arthrosis of the spine.

3. The gradual irreversible ligamentous relaxation following repeated attacks, acute or otherwise, and which practically invalidates the back.

The first of these three situations is to be met by prophylaxis. X-rays of the back should be routine for all heavy workers to eliminate those who, by virtue of a constitutionally weak back, are exceptional occupational hazards.

The second calls for careful selection of the type of work which is still within the limits of tolerance in an arthritic back.

The third, involving the chronic relaxed back, may call for operative fusion. Where, then does the manipulative treatment come in?

Remember, the only structure which calls for stretching is the persistently spastic contracted muscle; a condition which may persist, after the ligamentous structures have healed. Here is, I believe, the only place for manipulation.

DRS. LEGGO and WALKER have considered only the acute attack. As I said, no exception can be taken to the principle of rest, and it is particularly commendable of them to bring this point out forcibly when the tendencies are rampant for precocious mobilization and premature operative procedures.

Challenge

THIS country seems to be entering a new phase of its existence. Peace as we have known and enjoyed it in the past, may, with the outbreak of force in Korea, have vanished for some years. There loom before us now the difficult problems and uncertainties of what has been called the garrison state. A few days ago, before the Industrial Hygiene Foundation in Pittsburgh, Dean Donald K. David, of the Harvard Business School, looked closely at our times, and defined a new frontier towards which industry in this country might well address itself—the "frontier of knowledge of human and administrative affairs." In the dual civilian-military economy which we are entering upon now, Dean David pointed out, we shall have to be careful lest we lose, in the process of fighting, the very things we are fighting for—freedom, individual initiative, liberty .... This heritage we shall hold, largely, by our efforts to deepen and broaden our whole grasp of the worth and importance of the individual in our present industrial-defense society. In such, to Dean David's mind, do we find a serious and stimulating challenge today.

—*Boston Globe*, November 18, 1950.

Cardiovascular Disease in the Steel Industry

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Bethlehem, Pennsylvania

DESPITE the many advances in industrial medicine and the extension of services provided by plant medical units, there appears as yet little disposition to accept heart disease as a major problem in industrial health. Few industries have medical departments adequately staffed to conduct periodic examinations of all employees, so that, coincident with an aging plant population, new cases of heart disease appear and established cases progress undetected. Until disability or injury brings the employee under medical supervision there is no knowledge of the heart disease. In such cases, it is frequently too late for any attempt to modify the course of the disease by proper placement and supervision of the employee. It should, however, lead the physician to speculate on the number of such employees who might be found performing work entirely unsuited to individuals with heart disease.

It is estimated that there are 9,000,000 people in the United States afflicted with a form of heart disease.[1] This number is not static, and will increase proportionately with improvement in the average expected life span and with more accurate diagnoses. The realization that many job situations in a steel plant are unsuitable for employees with heart disease recently led the Medical Department of the Bethlehem Plant of Bethlehem Steel Company to adopt a more comprehensive cardiovascular examination, and to use whatever means were presently available to seek out the employee with cardiovascular disease. It is the purpose of this paper to describe that plan, and to report the results of the first two years of operation.

Procedure

AS A NECESSARY preliminary in any attempt to aid the employee with heart disease there must be a complete evaluation of his cardiovascular status with definitive knowledge of the job and the environment in which it is performed. Since the average pre-placement physical examination provides insufficient data for such an evaluation it is utilized mainly for screening purposes. All employees or applicants for employment suspected of having cardiovascular disease are now referred to the main plant clinic for a complete cardiovascular study.

In addition to a physical examination and a careful study of the history, this routine procedure includes chest x-ray, electrocardiogram, blood count, urinalysis, determination of blood sedimentation rate, hematocrit, and serologic test for syphilis. Fluoroscopic examination of the chest and lateral and oblique esophagrams to outline the chambers of the heart are freely used; additional laboratory tests are performed whenever they are indicated. The Master two-step exercise test,[2] although not used routinely, is a requisite whenever coronary insufficiency is suspected or when a measure of the degree of disability is sought.

The complete findings, if equivocal, are reviewed with one or more staff physicians, and where the diagnosis is in doubt, the case is discussed and the patient examined at a staff conference. From the available data an attempt is then made to evaluate the individual in terms of his capacity for work performance without possible injury to himself or fellow workers. This frequently requires the physician to visit the work location to assure himself of the suitability of both the work and the environment for that particular person. Transfer of employees, though sometimes necessary, is generally undesirable and usually impractical because of the highly specialized work and the advanced age of many employees. More often it is possible to modify or limit the type and quantity of work performed to make it commensurate with the workman's cardiac limitations. The requirements are outlined in a written statement of restrictions. After the nature and purpose of the restrictions have been explained to the employee, a letter is forwarded to the superintendent of the department setting forth precisely what the employee may and may not do. These letters have the approval of top management in principle, and compliance with the recommendations made is mandatory. On the physician's part there is accordingly the obligation to prescribe no unnecessary or impractical restrictions, yet he must take an inflexible stand once the need for them is established. Management does not issue indecisive orders to its supervisory personnel, and if such are received from the Medical Department, they are unlikely to achieve the purpose for which they are intended.

The restrictions imposed upon an employee may be of a temporary nature, in which case the department concerned is advised of the approximate date on which the employee's status is to be reviewed. In no case, however, may any restrictions be lifted until written notification has been received from the Medical Department, and no employee with restrictions may be transferred or assigned to another depart-

Presented in part at the meeting of the Section on Steel and Heavy Industry, AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, 25th Annual Meeting, Chicago, April 25, 1950.

ment, position or unit, without the approval of the Medical Department. The data obtained in each case are recorded on punch cards, and these are maintained in a separate file. Each month, cards are pulled on those individuals who are to be recalled for re-examination or re-appraisal during the month. In this manner periodic examination and follow-up of all known employees with heart disease are assured.

Case-Finding Methods

SINCE it was considered impractical to undertake the physical examination of all employees in the plant it was necessary to rely for case finding on the various types of examinations and procedures which have already been established as regular functions of the Plant Medical Department. Table I shows the number of cases discovered by these various means.

Pre-Employment Examinations: Except in the relatively few instances where an employee is reinstated, pre-employment examinations do not apply to the older workmen but offer reasonable assurance that any new employees are either free of cardiovascular disease or are placed in jobs for which they are suited. In the case of the latter, placement is made only after the applicant has been thoroughly evaluated, and employment is then recommended for a specific job only, from which the employee may not be transferred except with the approval of the Medical Department.

Periodic Examinations: These have long been conducted among special groups of employees, notably the plant supervisory personnel, all those exposed to the usual occupational hazards encountered in a steel plant, and those in occupations where extraordinary safety precautions are required such as cranemen, locomotive engineers and brakemen, charging machine operators, applicants for Gas School training, and many others. The scope of these examinations varies as does the interval between them, but if at any time a cardiovascular abnormality is noted or suspected, the employee is subjected to the prescribed cardiovascular study. He may return to work only after such job changes or restrictions have been made as deemed justifiable, and thereafter remains under strict observation and supervision.

Sick-Absentee Examinations: Sick-absentee examinations are required whenever an employee returns to work following any absence due to illness or injury. Designed to insure the fitness of the employee to resume his former duties, these examinations are now conducted with far more attention to the cardiovascular status. Every indication of heart disease as the cause of the absence from work is thoroughly investigated. Where formerly an employee known to have been disabled from heart disease was permitted to resume his former duties largely on the certification of his own physician, he must now demonstrate not only his ability to return to work, but also to return to the same job. His personal physician cannot be expected to know the circumstances surrounding the employee's work, and is accordingly far less resistant to his patient's pleas to be allowed to work than is the industrial physician who can and must maintain complete objectivity.

TABLE I.
CASE-FINDING METHODS

Type of Examination	Number
Pre-Employment	14
Periodic	90
Sick-Absenteeism	96
Clinic	8
Miniature Chest X-Ray	181
Total	389

Plant Clinic Examinations: The opportunity to examine sick or injured employees who are sent to the plant clinic or dispensary by their foremen is available to most industrial physicians, and not infrequently is the only means by which employees with heart disease may be detected. However, workmen traditionally and understandably conceal from the industrial physician any defect which they feel might jeopardize their jobs or their opportunities for advancement.

Except for the few cases of myocardial infarction which occur while the employee is at work, and the occasional case of unsuspected heart disease found during the treatment of an unrelated condition, this method has little to offer as a case-finding procedure.

Mass Chest X-Ray Survey: Public health agencies devoted to the control of tuberculosis have been quick to seize the opportunities offered by large industrial establishments for applying the technique of mass chest roentgenography employing miniature film. The steel industry, in common with others, has been subjected to strong pressure from groups seeking to conduct mass surveys within the plants. In the Bethlehem plant, management, on the advice of its Medical Department, took the position that the primary objective of these surveys—the discovery of active cases of tuberculosis—while a worthy one from a public health standpoint, was no more than equal in importance to any other aspect of industrial health. Accordingly, the Plant Medical Department itself conducted the survey, using the facilities of a commercial organization. The results were gratifying to all concerned, for management felt the expense had been justified and the Medical Department found, as have others,[2] that the number of cases of heart disease disclosed far outnumbered those of tuberculosis. Enumeration of the various abnormalities discovered is not within the scope of this paper but it may be mentioned that only five cases of active tuberculosis were found among the nearly 15,000 employees x-rayed. This is in sharp contrast to the 181 cases of significant cardiovascular disease uncovered.

TABLE II.
ETIOLOGIC DIAGNOSES IN 181 CASES DISCOVERED BY MASS MINIATURE X-RAY SURVEY

Disease	Number Cases	Per cent of Total
Arteriosclerosis	56	30.9
Hypertension	56	30.9
Combined Arteriosclerosis and Hypertension	29	16.0
Rheumatic Fever	19	10.5
Syphilis	14	7.8
Congenital Anomaly	2	1.1
Pulmonary Disease	2	1.1
Undetermined	3	1.7

TABLE III.
ETIOLOGY IN 389 CASES FROM ALL SOURCES

Etiology	Number Cases	Per cent of Total
Arteriosclerosis	132	34.70
Hypertension	127	32.60
Hypertension and Arteriosclerosis	52	13.30
Rheumatic Fever	41	10.10
Syphilis	21	5.30
Congenital Defect	5	1.25
Pulmonary Disease	3	0.75
Infection	1	0.25
Anemia	1	0.25
Neurasthenia	1	0.25
Undetermined	5	1.25
Total	389	100.00

TABLE IV.
ANATOMIC DIAGNOSES

Disease	Cases
Coronary Arteriosclerosis	
With Narrowing	49
With Occlusion	55
Aneurysm of Aorta	12
Aortitis	9
Left Ventricular Hypertrophy	56
Aneurysm of Heart	2
Mitral Valvular Disease	
With Stenosis	39
Aortic Valvular Disease	
With Stenosis	12
With Insufficiency	11
Pulmonic Valvular Disease	
With Stenosis	2
With Insufficiency	1

TABLE V.
ELECTROCARDIOGRAPHIC ABNORMALITIES

Abnormality	Total
Ventricular Hypertrophy	77
Myocardial Infarction	51
Conduction Defects	37
Defective Mechanism	22
Coronary Insufficiency	21
Auricular Hypertrophy	11
Digitalis Intoxication	2
Acute Pericarditis	1

Table II indicates that any of the common types of cardiovascular disease may be suspected from the miniature films, although the etiology is not always apparent until a thorough study of the individual has been made. Since the recognition of heart disease from the films alone depends upon changes in the size and contour of the heart and great vessels, this method of case finding has limitations, and many more cases remain to be discovered by other means.

Results

WITH few modifications, the criteria and nomenclature of the American Heart Association[1] were used throughout the study. In the tabulation of the results (Table III), it is apparent that there is an astonishing variety of cardiovascular abnormalities to be found in a large group of presumably healthy workmen. Equally astonishing are the environmental situations in which they may be found. A not so unique example is the case of the employee with severe hypertension, associated with advanced retinal changes and renal dysfunction, who was found operating a locomotive to transport molten metal in an area where an accident might have had disastrous results.

The anatomic diagnoses shown in Table IV include all the diagnoses made in the 389 cases some of which had multiple pathologic findings. Thus tortuosity of the aorta was considered abnormal only when of a marked degree, and in these cases it was rarely attributable to simple senile ectasia alone, but was usually associated with hypertension and left ventricular hypertrophy or another abnormality of the cardiovascular system. Similarly, atherosclerosis of the aorta is a much more common finding than our results indicate. As an isolated finding, manifested by the presence of calcified plaques in the aorta, it was considered significant only insofar as it justified a search for evidence of arteriosclerotic heart disease.

The identification of the specific defect in congenital heart disease is usually difficult, and sometimes impossible without resorting to angiocardiography and right heart catheterization. Since these procedures are hardly adaptable to industrial medical practice, there is greater likelihood of errors of diagnosis in this group.

The electrocardiographic diagnoses are listed in Table V and here, too, multiple diagnoses were common. The importance of the electrocardiogram in a study of this kind need hardly be emphasized since it is well known that in many cases the electrocardiogram is the only means by which the presence of serious heart disease can be recognized. It is doubly valuable in industrial medical practice because of the unreliability of a negative history, a factor which makes the incidence of "silent" myocardial infarction in industry unreasonably high.

Diabetes was found in 18 cases, or 4.6% of the employees with cardiovascular disease, and three had bronchial (allergic) asthma. In one case, heart disease was complicated by spontaneous pneumothorax, and, in another, central nervous system syphilis was found in association with pure aortic stenosis and a history of rheumatic fever.

Of the 389 cases thus far discovered, it has been found necessary to transfer only nine to more suitable employment. In an additional 80 cases permanent restrictions were imposed, the most common relating to climbing, strenuous effort, and the operation of moving machinery. Temporary restrictions regulating the employees' hours of work and the type of work done were imposed in 21 cases, most of them following

myocardial infarction. In such cases, restriction to the day shift and of the number of hours to be worked daily were later lifted.

Comment

EVEN under normal circumstances virtually half the employees of a steel plant may be over 40 years of age. Wartime conditions may be expected to swell the number of aging employees in an industry in which the work is often laborious and where exposure to high temperatures and hazardous surroundings forms an inherent part of the manufacturing process. The significance of heart disease in relation to employment in the steel industry is therefore quite clear. Considerable emphasis has been applied to the importance of proper placement in industrial medical practice but little recognition has been given to the obvious fact that men grow old on the job. They develop disabling defects, and quite often remain on a job for which they have long ceased to be physically qualified. Employees will understandably persist in performing a job which they have held for years and have worked hard to obtain, sometimes by sheer determination alone. Such men deserve an opportunity to continue in gainful and satisfying employment, but to do so without harmful consequences. Proper placement only begins with the pre-employment examination; it does not end there. The obligation of the Plant Medical Department to maintain continuous supervision over the health of its employees is a fundamental precept in industrial medicine which is often subject to compromise through limitations in facilities and personnel. In reporting the present study there is no intention of implying that it represents a complete and final solution to the problem of heart disease in the steel industry. Unquestionably many employees in our plant with heart disease are still undetected and will ultimately suffer disability or death from the disease. The procedure here described is, however, believed to represent a necessary beginning to the solution of this problem.

Summary

THE results of a study of the prevalence of cardiovascular disease in a large steel plant are reported, and the case-finding methods described.

The value of the mass chest x-ray survey using miniature film as a method of case finding is emphasized, and the significance of cardiovascular disease in the steel industry is discussed.

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MEMO to four lads: Frankly, guys, this Christmas of 1950 has your spavined old pappy scared silly. Time was when your mummy and I just sort of relaxed into a warm bright glow of happiness on Christmas Eve. We'd start with an early dinner. Very special affair. Four eager little guys manfully eating every bite of spinach and not spilling a drop of milk and not even kicking each other under the table for fear old Santa might be looking. After dinner every small man of you trudged dutifully upstairs for his bath. That was the one night in the year you scrubbed even where it didn't show. You'd traipse downstairs for your prayers and stare dubiously at the blaze in the fireplace and trudge reluctantly back to bed. Then your mummy would wink happily at me and I'd wink back and drag the tree in from the garage, while she unloaded Santa's cache in the fruit cellar. It would be nearly midnight before we had every gay baubble on the tree.... every little toy marching gloriously underneath. We'd sit together.... very close together.... before the fire.... just a couple of married people with their own little world warm and secure and tucked in around the edges. Lucky people.... with four little rascals upstairs dreaming of the great-hearted saint with the whiskers. So it's Christmas time, A.D. 1950. You lads have outgrown Santa Claus and toy trains and small stockings hung by the fire. You're into your teens.... almost ready for the real world that must inevitably follow the happy cloisters of childhood. Your tree of Christmas is too tall now for any house built by men.... too tall, perhaps, for this bleeding battered planet called Earth. And before it, this Christmas time, 1950, we grownups stands with empty arms. We have no blazing star of God's peace for its topmost branch. Our Christmas star is tarnished with greed and drenched in blood and cold with hate. For the Tree's wide branches we have no bright baubles of joy for human eyes or human hearts. There have been vandals in the house of mankind and the pretty things are ground into the dreary dust. Precious few are the candles still lit with faith and hope and God's charity. It *was* too *easy*, perhaps, for us to give you, in your years of infancy, the gay tinsel world that is a mere child's symbol of Christmas. Somehow, it has been too *difficult* to translate those bright symbols into blessed reality. Your mummy and I and the rest of the grownup family of mankind stand in terrible, pitiful, helpless shame before the horror of our Christmas world. We *can* give you only our own clouded vision of the Star in the East. We can point out perhaps, the path to the stable of Bethlehem.... to the musty manger where the Child lay in swaddling clothes. And it may come to pass that your ears will hear.... more clearly than ours.... the songs of the angels on high.... that your eyes may see.... more truly.... the glory of the Infant.... that your hearts may feel what ours have not.... the humble faith of the Magi.... in the fellowship of the Son of Man. With these precious things.... disowned by our generation.... we wistfully deck your tree of Christmas.

—TONY WEITZEL, in "The Town Crier," in *Chicago Daily News*, December 23, 1950.

Fifteen Years Later

The Fifteenth Annual Meeting of the Industrial Hygiene Foundation

November 15 and 16, 1950

FEW persons who convened at the Mellon Institute in Pittsburgh on November 15 for the Annual Meeting of the Industrial Hygiene Foundation, also participated in the pre-organization meeting in 1934. The recollections of these favored few invited comparisons. That initial group was eager but uncertain. The land was harried by silicosis, real and imaginary. In an occasional locality near panic prevailed; some workers were dying and some work places were closing their doors because of legal onslaught. It is no matter of wonder that the organization, when soon achieved, adopted as its original name, the Air Hygiene Foundation. In trepidation it appeared that silicosis would become a hardy perennial.

The Fifteenth Annual Meeting was strangely different. The major difficulty was not silicosis or any other devastating occupational disease but, instead, how to keep away the hundreds of would-be participants for whom there were no accommodations either in auditoria or hotels. For the limited number permitted to attend, this same difficulty arose in necessity for sectional meetings, diversion into smaller groups through sheer lack of seating capacity. This unavoidable segregation brought about paradoxes. In one symposium the chemists devoted themselves to occupational cancer, commonly accepted as a medical topic, while at the same hour, the physicians present were sharing in a conference directed to the legal aspects of compensation. All of this is healthy and reflects the inescapable overlapping of the functions of engineers, chemists, attorneys and physicians in industry.

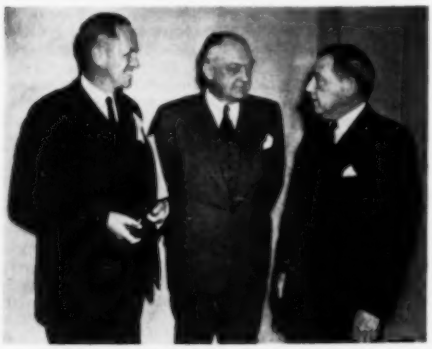
While the program was neatly balanced to embrace proper consideration for newer occupational diseases, engineering perplexities related to air pollution, compensation, and radiant heat, the keynote and high point of this Fifteenth Annual Meeting, shared in by representatives from more than 300 company members and invited guests, was "The Human Side of Industry." The Industrial Hygiene Foundation, among other far-thinking groups and individuals, is discovering that industrial hygiene is not a constricted area of physical affronts to workmen exemplified by dusts, gases, vapors and vibrations but, instead, is far flung into the total life of the workman, his motivations, inhibitions, aspirations, and every other quality that determines adjustment to work and to life. These concepts were crystallized at the general meeting through the keynote speaker, DR. DONALD K. DAVID, Dean of the Graduate School of

A view of the audience during the General Meeting on November 16.

Business Administration, Harvard University. DR. DAVID'S keen appreciations of the human side of industry were extended through other discussions by spokesmen for labor, for foremen, and for management, respectively, CLINTON S. GOLDEN, HENRY A. MAXON and TITO A. TARQUINIO, and A. V. MURRAY.

In the more technical discussions, the physicians present reached their highest mesa in the symposium on "The Cardiac in Industry," ably presented by DRS. ANDREW C. IVY, ARTHUR M. MASTER, and EDWARD M. KLINE; the chemists contributed prodigiously in their symposium on "Occupational Cancer" in which highly impressive was the announcement by DR. ARTHUR J. VORWALD of the capacity of some beryllium compounds to induce characteristic neoplastic growths under experimental conditions; and the session devoted to "Industrial Noise," demonstrated, through DRS. PAUL H. GEIGER and LEO L. BERANEK, the little recognized magnitude of toll exacted by unnecessary, controllable industrial noises. Other and significant conferences, some restricted and some general, were devoted to the import of radiant heat, stream and air pollution, compensation loss, and the economics of worker safeguards. Notable in the entire series of sessions was the report of the Foundation's Medical Director, DR. C. RICHARD WALMER, embracing his experiences in appraisal of diversified industrial medical departments' facilities and administrations.

A note of distress pervaded this Annual Meeting because of the shortly earlier death of the Foundation's Director, JOHN F. MCMAHON, a loss appropriately recorded by DR. EDWARD R. WEIDLEIN, Director of the Mellon Institute. Wide was the awareness that a force of cohesion, long symbolized by JOHN MCMAHON, was lacking. No little speculation forecast his probable successor. In more recent weeks this speculation was dissipated through the formal election of DR. C. RICHARD WALMER to this post. In the minds of all, is the comfortable assurance that DR. WALMER, without departing from the pattern of forthright achievement of the Foundation, will extend the influence of this unselfish organization in areas both numerical and scientific.



Left to right: Andrew Fletcher, President, St. Joseph Lead Company, and Chairman of the Board, Industrial Hygiene Foundation; Dr. Donald K. David, Dean, Graduate School of Business Administration, Harvard University; and Edward R. Weidlein, Director, Mellon Institute.

V. P. Ahearn, Executive Secretary, National Industrial Sand Association, Washington, D. C.

The success of any assemblage, social or scientific, always may be appraised by unwillingness of those attending to face the fact that it is over. On all sides at this Fifteenth Annual Meeting were sincere expressions, "It was so good it should have been a little longer"....."just a little more." That's success.

The Program

(The following program summary is from the Foundation's report of the meeting.)

KEYNOTE speaker at the General Meeting was DR. DONALD K. DAVID, Dean, Graduate School of Business Administration, Harvard University, who spoke on the "Human Side of Business," following a tribute to the late MR. JOHN F. MCMAHON, former Managing Director of the Foundation, whose death in September was a serious loss to the field of industrial hygiene.

After DEAN DAVID'S address, a panel discussion on "Teamwork for a Better Workplace," which dealt with the implementing of the meeting's theme: "The Human Side of Industry," was presented by A. V. MURRAY, president, Scaife Company; HENRY A. MAXON and TITO A. TARQUINIO, foremen, American Brake Shoe Company; and CLINTON S. GOLDEN, labor adviser, Economic Cooperation Administration, with VINCENT P. AHEARN, executive secretary, National Industrial Sand Association, presiding.

The afternoon session, with DR. MAX R. BURNELL presiding, included three talks. JAMES M. GILLEN,

director, Personnel Research Section, General Motors, spoke on the "Cost of Employee Disability to the Employer." A paper on "Auditing Industry's Departments, Facilities and Administration' was presented by DR. C. RICHARD WALMER, Medical Director of the Foundation. And, concluding the program, DR. THOMAS L. SHIPMAN, Health Division Leader, Los Alamos Scientific Laboratory, spoke on the "Protection of Personnel and Plants in an Atomic Emergency."

The professional conferences held on Wednesday, the day before the general meeting, attracted several hundred specialists from member companies. There were four conferences, Medical, Legal, Chemical and Engineering, with half-day, joint Medical-Legal and Chemical-Engineering sessions.

The Medical Conference, to which all members of the medical profession were invited, presented an interesting symposium on "The Cardiac in Industry," with DR. A. J. LANZA as chairman. Papers were read by DR. ANDREW C. IVY, vice-president, University of Illinois, in charge of Chicago Professional Colleges, DR. ARTHUR M. MASTER, associate clinical professor of medicine, Columbia University College of Physicians and Surgeons and DR. HARRY L. JAFFE, Mt. Sinai Hospital, New York City, and DR. EDWARD M. KLINE, medical consultant, General Electric Company. The papers were discussed by DR. ANDREW P. D'ZMURA, professor of medicine, University of Pittsburgh, in charge of Teaching Division, St. Francis Hospital, and DR. RAYMOND HUSSEY, scientific director, Council on Industrial Health, American Medical Association.

The Legal Conference included papers on current legislation relating to control of air pollution and stream pollution, current developments in workmen's compensation, and legislative provisions dealing with the creation of medical boards, medical examiners and medical care under occupational disease compensation laws, by RICHARD F. HANSEN, assistant secretary, General Chemical Division, Allied Chemical and Dye Corporation, J. R. HOFFERT, chief engineer, Department of Health of Pennsylvania, R. WORTH VAUGHAN, vice-president, American Smelting and Refining Company, and THEODORE C. WATERS, of Mullikan, Stockbridge and Waters, Baltimore, who was also chairman of the Conference.

In the afternoon, there was a joint Medical-Legal Conference on the administration of workmen's compensation laws, under the chairmenship of DR. LANZA and B. E. KUECHLE, vice-president, Employers Mutual Liability Insurance Company. Participating in a panel discussion were C. R. FAY, Pittsburgh Plate Glass Company, WILLIAM L. CONNOLLY, director, Bureau of Labor Standards, U.S. Department of Labor, HON. JAMES L. HILL, chairman, Workmen's Compensation Commission of Michigan, and DR. L. C. MCGEE, Hercules Powder Company.

In the morning the Chemical and Engineering sections met in joint conference to hear a series of papers devoted to the Evaluation and Control of Radiant Heat, and the Suppression of Industrial Noise. Radiant heat problems of exposure were discussed from several viewpoints: basic considerations in industrial heat exposure, methods of evaluation, control measures—and a model demonstration of radiant heat exposure was presented. Participating were THEODORE F. HATCH, of the Industrial Hygiene Foundation and the Graduate School of Public Health of the University, GEORGE F. HAINES, JR., of the Foundation, WILLIAM G. HAZARD, Owens-Illinois Glass Company, and KARL L. DUNN, Corning Glass Works. Papers on industrial noise were read by DR. LEO L. BERANEK, Acoustics Laboratory, Massachusetts Institute of Technology, and DR. PAUL H. GEIGER, Engineering Research Institute, University of Michigan.

Thomas L. Shipman, Health Division Leader, Los Alamos Scientific Laboratory, Los Alamos, New Mexico.

The afternoon Chemical and Toxicological Conference was given over to a symposium on Occupational Cancer. Among the subjects covered were the relationships of carbon black, petroleum fractions, arsenic, and beryllium to cancer. Speakers were DR. EMMERICH VON HAAM, professor of pathology, Ohio State University College of Medicine, DR. R. E. ECKHARDT, Standard Oil Company (N.J.) research division, DR. L. S. SNEGIREFF, associate professor of cancer control, Harvard School of Public Health, and DR. ARTHUR J. VORWALD, director, the Trudeau Foundation and the Saranac Laboratory.

The Engineering Conference heard several papers: control of sulfur dioxide from industrial stacks; air jets in relation to ventilation devices; wintertime recirculation of air from dust collectors. Speakers were E. P. FLEMING, engineer, Los Angeles, WARD L. DAVIDSON, Consolidated Edison Company, JOHN G. WEHN, St. Joseph Lead Company, W. C. L. HEMEON, Industrial Hygiene Foundation, and WILLIAM N. WITHERIDGE, consultant to General Motors.

ASSOCIATION NEWS

THE A.A.I.P. & S. Committee on Change in Constitution and By-laws held an important and lengthy meeting at Hotel Statler, in Detroit, Michigan, Sunday, December 3, 1950. Committee members present were DR. E. A. IRVIN, Chairman, DRS. HENRY S. BROWN, J. DUANE MILLER, EDWARD C. HOLMBLAD, and JAMES H. STERNER. DR. JEROME W. SHILLING sent his recommendations to the chairman by mail. Association officers CARLETON, KAMMER, WILKINS and PETERSON were also in attendance, and numerous changes were drafted for presentation to the Board of Directors at their meeting on December 4. On that day the proposed changes were studied and discussed by the Board of Directors and subsequently approved. Within the next month or so these revisions as proposed will be submitted to the membership at large so that final action can be taken at the annual business meeting in Atlantic City on Thursday afternoon, April 26, 1951. The proposed changes will also be published in the February or March issue of INDUSTRIAL MEDICINE AND SURGERY.

There were 12 officers and directors at the Board of Directors' meeting on December 4, together with DR. EDWIN DEJONGH, Chairman of the Membership and Qualifications Committee, DR. EARL F. LUTZ, Counselor, District No. 7, and Past-President ALFRED H. WHITTAKER. Reports were heard from the Speakers' Bureau, representatives of A.A.I.P. & S. on the Z37 and Z62 Committees of the American Standards Association, and various District Counselors and Committee Chairmen. Appointments were made to several committees of allied groups working on industrial health matters, and the activities of this Association along the line of cooperation with other groups were discussed in detail. It was decided that this Association would join in a one-session symposium on occupational chest diseases with the American College of Chest Physicians, in Atlantic City the second week in June, 1951. DR. CARLETON reported encouraging progress by the Joint Committee of the A.A.I.P. & S., the Council on Industrial Health of the A.M.A., and the A.A.I.N. Committee on Standing Orders for Nurses. DR. KAMMER outlined the excellent preparations being made for the 1951 Industrial Health Conference in Atlantic City, April 21-28, 1951. Progress reports of the Annual Awards Committees were read.

Deaths

DAVID A. MORRISON, M.D., 54, at Kokomo, Indiana; A.A.I.P. & S. member through CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY. DR. MORRISON received his M.D. at Indiana University; and was Chief of Surgery St. Joseph Memorial Hospital, and Surgeon for Globe American, American Radiator, Standard Sanitary, and Chrysler Corporation.

WENZEL M. WOCHOS, M.D., 76, of Kewaunee, Wisconsin, A.A.I.P. & S. member since 1937 through the CENTRAL STATES SOCIETY OF INDUSTRIAL MEDICINE AND SURGERY, on March 15, 1950. DR. WOCHOS graduated at the College of Physicians and Surgeons of Chicago, School of Medicine of the University of Illinois, 1903; served as a member of the draft board during World War I, and as examining physician for Selective Service during World War II; and many years was a member of the park board and president of the high school board. He was Industrial Physician and Surgeon for numerous local industries.

LELAND FRANCIS CARLTON, M.D., 62, of Tampa, Florida, member of A.A.I.P. & S. for many years through the FLORIDA ASSOCIATION OF INDUSTRIAL AND RAILWAY SURGEONS, at University of Chicago Hospital, June 5, 1950. DR. CARLTON graduated M.D. at Rush Medical, 1914; was a member of the founders group of the American Board of Surgery; a member of the Southeastern Surgical Congress; a Fellow of the American College of Surgeons; and past-president of the Florida Railroad Surgeons Association and the Association of Seaboard Air Line Railway Surgeons.

LESLIE ALBERT VANDER LINDE, M.D., 66, at Milwaukee, Wisconsin, August 5, 1950. He was a graduate of Hahnemann Medical College and Hospital, Chicago, 1908; was an A.A.I.P. & S. member through the CENTRAL STATES SOCIETY, December 9, 1938; became a Fellow in 1941; and was for many years affiliated with St. Mary's Hospital. He specialized in industrial surgery, and was Surgeon for the Harnischfeger Corporation and numerous insurance companies.

ARCHIE M. BAKER, M.D., 54, orthopedic surgeon, member of A.A.I.P. & S. through the NEW YORK STATE SOCIETY OF INDUSTRIAL MEDICINE for many years, September 24, at Lindenhurst, New York, He graduated at Syracuse University College of Medicine in 1922. He was a Fellow of the A.M.A.

FREDERICK CLINTON KIDNER, M.D., 71, of Detroit, at Harper Hospital, October 20, 1950. DR. KIDNER was an outstanding orthopedic surgeon who early understood the importance of the industrial point of view in studying orthopedic problems. He was an A.A.I.P. & S. member for many years until 1945, at which time he retired. He carried his membership through the MICHIGAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, in which he was much interested.

EARL E. MORGAN, M.D., 57, of Sioux City, Iowa, at the Iowa-Notre Dame football game, November 18, 1950. DR. MORGAN graduated M.D. at the State University of Iowa College of Medicine in 1920; and did industrial medical work for Cudahy Packing Co., Armour Packing Co., and Sioux City Gas and Electric and Sioux City Service Companies. He was Vice-President of the Woodburn County Medical Society in 1937; A.A.I.P. & S. member through the CENTRAL STATES SOCIETY since 1937; A.A.I.P. & S. Fellow since 1939.

JOHN J. KOLSKI, M.D., 63, at Pittsburgh, November 19, 1950. DR. KOLSKI was a graduate of the Medico-Chirurgical College, Philadelphia, June,, 1911; did industrial medical work for General Electric Co., Oliver Iron & Steel Co., and Jones & Laughlin Steel Co.; and was Medical Examiner U.S. Army (local board 1941) in 1918-19. He was elected to active membership, A.A.I.P. & S., June 21, 1948.

PRODUCT RESEARCH AND DEVELOPMENT

Articles selected for publication in this section of the Journal are related to commercial or prospectively commercial products and, by requirement, are written by physicians, represent original work not previously published, and have some flavor of newness. These articles are published so that newer products may become the recipients of further consideration and appraisal in the industrial medical field. The claims and conclusions of authors are not necessarily approved or accepted by this Journal.

Antihistaminics in the Treatment of Burns

— A Preliminary Report —

MORTON M. KESSLER, M.D.
North Arlington, New Jersey

THE principle of antihistamine therapy is new, and not all of its practical applications are realized. The role of histamine in the production of serum oozing and edema following burns has been demonstrated many times. It logically follows that the antihistaminics might be effective in blocking some of these reactions.

Gunnar and Weeks[1] in a series of animal studies demonstrated the ability of the antihistaminics to cause localization of vital dyes incorporated in the injection of histamine phosphate. They also studied the effects of these drugs on vasodilatation and capillary permeability in chemical and thermal burns in animals. They stated that, in their series, vasodilatation was decreased from 25% to 78%. However, capillary permeability was unaffected by the antihistaminics. In their work, the animals received the antihistaminics before the wheal or burn was induced. No post-traumatic medication was given. They evaluated capillary permeability in terms of edema and cellular reaction to the burns. The important point of this experiment was that vasodilatation was decreased.

Haley and Harris[2] studied the effect of antihistamine drugs on the mammalian capillary bed, and concluded that the drug had a vasoconstrictor action on the precapillary sphincters, while histamine had a vasodilator action. They stated further that the vasoconstrictor effect was produced with dosages which parallel other animal or human therapeutic doses. They concluded that both histamine and antihistaminics act at the same site; that the antihistaminics did not decrease the blood level of histamine, but simply blocked its action. Since the precapillary sphincters were constricted, the blood volume in the capillary bed was decreased and the amount of extravasation of fluid was decreased. Another observation was that the antihistaminics and epinephrine caused the white cells to adhere to the vessel walls, while histamine caused the white cells to flow freely.

On the basis of this information, it was felt that the antihistaminics would be effective in the treatment of human burns, and a study was undertaken.

All of the cases seen in our series were first and second degree burns and varied in extent from 1 cm. in diameter to an area involving the face, neck, and chest. Thirty cases were observed, 19 of which were first degree burns, and 11 were second degree burns. A comparable group was taken as a control, in which the treatment was identical but the antihistaminics were excluded. The untreated group consisted of 30, of which 21 were first degree, and nine were second degree. The type of burns included steam, welding, dry heat, carbon dioxide, sulphuric acid, nitric acid, and acetic anhydride. The therapeutic routine employed consisted of the local application of a bland ointment, and institution of oral antihistamine therapy in one group, and no antihistamine therapy in the second group.

Dosage: Antistine® (Ciba) 100 mg., and Hydryllin® (Searle) were used. The dosage was one tablet every three to four hours. No attempt was made to compare the effectiveness of these two drugs, since previous experience had taught us that these two preparations gave the fewest side reactions.

Observations: The wounds were observed on the second and third day, or longer if necessary, since some of the burns were both first and second degree in extent. Pure first degree burns treated with antihistaminics responded dramatically. By the second day, the erythema disappeared completely. No evidence of local edema was present. In the control group, the erythema persisted on the second day. Approximately 40% developed tissue edema. The average duration of external evidence of the burn in the control group was three to five days.

In the second degree burn group treated with antihistaminics, the areas of erythema were decreased. The vesicles shriveled, and, in some cases, the fluid within them disappeared, leaving a red granular surface when the skin was removed. This was especially obvious in those cases in which the lesions were 1 cm. or larger. In those cases in which the vesicle was ruptured accidentally or by intention, the oozing serum was decreased considerably by the second day. If the antihistamines were stopped, the oozing

increased. Reinstitution of therapy again decreased or stopped the oozing. No edema was present at the wound edge. The control group of second degree burns not treated with antihistamines presented an increased number of vesicles on the second day, considerable fluid within the vesicles, and continuous weeping of denuded areas, until the seventh day when good granulation and skin were beginning to form.

Too few cases were observed to determine the effect on healing time. However, indications are that the healing time is decreased. Problems now under investigation are (1) whether healing time is decreased, (2) whether secondary infection is decreased, and (3) the effect of antihistamine therapy on the course of third degree burns.

Conclusion

IN THE group of burns treated with bland ointment and oral antihistaminics, first degree burns responded in all the cases, as evidenced by a decrease in erythema of approximately 75% to 90%. The duration of treatment definitely was shortened; in the second degree burns, the amount of vesiculation was decreased, the tissue oozing was markedly diminished, and the healing time apparently was shortened. The tissue edema surrounding the exposed wound was decreased, implying a definite maintenance of fairly normal vascular permeability. It is felt that the lack of edema encouraged more normal tissue circulation, thereby improving the focal nutritional status. The untreated group presented the usual amount of edema and oozing expectable in a burned area.

Summary

A GROUP of 30 patients with first and second degree burns were treated with bland ointment and oral antihistaminics. A control group of 30 patients received only the bland ointment. The erythema and edema were diminished in those cases treated with antihistaminics, and the healing time apparently was decreased. Further study is being undertaken.

(60 Ridge Road.)

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1. WEEKS, R. E., GUNNAR, R. M.: Effects of Tritelennamine Hydrochloride on Acute Inflammation. *Arch. Path.*, 48:178 (Aug.) 1949.

2. HALEY, T. J., HARRIS, D. H.: The Effects of Tropically Applied Antihistaminic Drugs on the Mammalian Capillary Bed. *J. Pharmacol. & Exper. Therap.*, 95:293 (March) 1949.

LETTERS

The American Board

TO THE EDITORS: I would like to comment on DR. LEGGE'S comprehensive editorial in the Journal on founding an American Board of Industrial Medicine. As he ably stated, there are many reasons for its early establishment. Unlike the requirements of some boards now in existence, the candidate for the proposed American Board of Industrial Medicine must have a broad knowledge of general medicine and surgery, plus a special knowledge of industrial medicine regarding such matters as compensation, safety, industrial processes, poisons, etc. Contrast this with, say, the limited fields of allergy and dermatology, which have specialty boards.

The various boards require a length of time to have been devoted to this specialty, usually three years. However, this is often exercised in the breach rather than in the observance, as witness the residents fresh out of hospital taking specialty board examinations. The Board of Industrial Medicine could require 10 or even 15 years on the part of candidates in this special field; no other board has this long a time as a requirement for admission. Such a stipulation in itself would help to guarantee candidates well-schooled in the field.

It would seem that industrial medical men have not pleaded enough with the American Medical Association regarding this special board. It is hoped that their committee may now become energetic and begin the "renewed action" DR. LEGGE suggests.

—BERNARD S. DIGNAM, M.D.

The National Health Service Act in Great Britain

TO THE EDITORS: There are widely divergent opinions concerning the efficiency and general success of the National Health Service Act. Laymen of the upper social classes tend, in general, to be critical of the Act and to continue as private patients. The laboring classes tend to favor the Act even though they recognize numerous disadvantages and deficiencies in the service. The general practitioners of medicine seem, as a rule, to be increasingly intolerant of the scheme. Specialists working as consultants with the service are, with exceptions, not overly pessimistic about its future, although they are highly critical of specific flaws in its present operation. Instances in which patients have been waiting a year for admission to hospitals for elective surgery are readily encountered. Dental and ophthalmologic services are lagging greatly. Hospital facilities are tremendously crowded. Acutely or severely ill patients are able to get rather prompt symptomatic care from the general practitioners. The scheme of specialist consultation appears well on paper but wants in practical and efficient application. Medical teaching remains as the "status quo" and is apparently not geared to the medical needs of tomorrow. Curative medicine is given precedence, even to the extent of devoting two large wards in one teaching hospital for one surgery sub-specialty, while preventive medicine (social medicine) was given no mention in the teaching curriculum. The lot of the general practitioner, contrary to his hopes, has not improved under the system. At the end of the first year, his status as an "honorable and renowned" citizen has lessened.

The Health Service plan, as it exists today, is in essence only an extension of a similar service plan in operation in 1912 under the leadership of Lloyd George. Under that plan, workers (32½ million) themselves received little less service than they do under the present set-up, but the families of the workers were not cared for without cost to them until the passage of the present Act.

Since their inception, the hospitals in England have been able to operate on endowments, lotteries,

drives, etc. However, they floundered financially after the withdrawal of the government support which had been extended them during the recent war. It is the consensus that a National Health Service Act of a sort was imperative at the end of World War II, and, irrespective of which political party came to power, the government would have either to subsidize or take over medical service.

The administrative organization of the service is such that each of 14 major regional boards (each consisting of about 30 physicians and laymen) coordinates the care of approximately 3,000,000 individuals. The supreme authority is the Minister of Health.

Private practice, both by general practitioners and specialists, is allowed to continue. However, there is an evident disapproval of it, and obstacles to it are increasing. For example, the number of beds allocated to private patients in government and teaching hospitals is rather rapidly diminishing. Without such facilities, private practice, of course, is severely handicapped.

A positive preventive medical approach is entirely lacking—so lacking that even smallpox vaccination is no longer compulsory, in spite of the fact that there are sporadic outbreaks. This also applies to typhoid, diphtheria, etc.

The question has come up as to the role of medicine in industry, as all business is heavily taxed to support the National Health Service Act. Those who are not familiar with the function of industrial medical organizations are under the misunderstanding that industrial medicine services of all kinds are duplicates of services available under the National Health Service Act. This could not be farther from the truth, as by actual fact, the exact opposite situation exists. It is practically impossible for anyone to get a thorough diagnostic work-up. There are no diagnostic facilities available except at a teaching hospital level, and these are overtaxed at present by the already ill patient.

Industries, pressed from all sources for increased hourly rates, annuity benefits, etc., in my opinion, will be forced, for economic reasons if for no other, to establish constructive health programs of their own which include pre-placement and periodic medical examinations in order to keep their employees healthy and on the job. In addition, they should be prepared to pay complete therapeutic costs in cases of valuable employees who become ill, if it is desired that they return to work promptly and not spend, for example, as much as six months delay in getting a hernia repaired.

—R. C. PAGE, M.D.

MEDICALLY IRRELEVANT

TOPS among our "pet peeves" is the linguistic monstrosity "cut in half." Worse, are the variations introduced by successive newcomers to public speaking and writing. Unsure of their knowledge of English, they "tear in half," "sever in half," "divide in half," "saw a woman in half," etc., *ad nauseum*. Always we wonder which half. And why not "cut in third?" or "sever in fourth?" It's a good trick, however it's done. Possibly the *reductio ad absurdum* is a U. S. Senator's recent statement: "The economic basis of the western world was cut in half three different ways." That *is* something!

TEETH on edge? Indication that psychosomatic factors may have a part in oral health has been reported in *Science* in a study of 49 persons by a standard personality test. Of those showing neurotic tendencies, 76% had more than 40 teeth decayed, missing or filled, while 85% of those with no neurotic tendencies had less than 40 teeth decayed, missing or filled. *J.A.M.A.* comments that there seems to be a significant correlation but the subject calls for further investigation.

THE "flicker photometer," a result of 10 years of research by Ivy and Krasno, is an electrical device in a black box with a tiny window of light. In the test, a patient's reaction to the flicker is recorded, he is given a tablet of nitroglycerin, and a second reaction to the flicker is recorded. Interpretation depends on whether nitroglycerin increases or decreases the patient's ability to see flickering light. In addition to diagnosis, the flicker photometer may make it possible to determine the effectiveness of treatment in hypertension and coronary thrombosis or tendency toward these two diseases before the usual symptoms appear.

—*Modern Medicine*, July 15, 1950.

BERN BENSON supervises hospital controls for Minneapolis-Honeywell (they make everything from explosion-proof operating room valves to baby incubator controls). He got so interested in hospitals he has now discovered (a) American hospitals now feed 1,500,000 people a day . . . . 60% needing room service; (b) the raw food bill in hospitals totals half a billion dollars a year; (c) they require 200,000,000 gallons of hot water a year; (d) U.S. hospitals use 7,500,000 windows, 5,800,000 sheets, three billion paper napkins, and 22 million drinking glasses; (e) last year 84,145 bassinets took care of 2,136,373 babies born in the hospitals.

—From "The Town Crier," by TONY WEITZEL, in *Chicago Daily News*, August 12, 1950.

WHAT if Death took a holiday? Think of the chaos if we went for an entire year without a death in the world. Doctors, druggists, nurses, morticians, medical suppliers, hearse builders, casket manufacturers, florists, even ministers would feel it. "The year nobody died" would really make history, wouldn't it? . . . . NO WONDER we need tax experts and lawyers and accountants. Take a look at this verbatim quote from section 23 of the internal revenue code: "General rule—if contributions are paid by an employer to or under a stock bonus, pension, profit-sharing or annuity plan, or if compensation is paid or accrued on account of any employee under a plan deferring the receipt of such compensation, such contributions or compensation shall not be deductible under subsection "A" but shall be deductible if deductible under subsection "A" without regard to this subsection, under this subsection but only to the following extent . . . ."

—From the *Minneapolis Star and Tribune* Column by CEDRIC ADAMS, in *The New Yorker*.

DID you read about the man who parked his car in a "No Parking" area in front of a large office building and left a note on the windshield which read, "I am a physician—I am inside on business." Two hours later he returned to his automobile to find an official cardboard ticket on the door handle and another note on the windshield: "I am a policeman—I am outside on business."

—From *Detroit Medical News*, November 6, 1950.

Personalities—

Dr. Henry F. Smyth, Jr. of Mellon Institute, with his silk screen creations, for which he is noted.

HENRY F. SMYTH, JR.
Registered Professional Engineer (Pennsylvania)

UNTIL the middle of 1949 I was the despair of an artistic wife and friends. They laughed when I got up to talk, because I couldn't describe a color in recognizable words, nor could I draw a natural object except a crystal. My ability to sketch machinery caused no pride because my lettering was Cro-Magnon. Now all is changed. They sit at my feet, marveling at gorgeously decorative silk screen prints, drinking in explanations that the silk is a tool, not a surface painted upon.

You too can attain success by following simple directions. Get a job studying toxicity for Union Carbide and Carbon Corporation, but work so far away that they can't see what you are doing. Do your desk work at home in the evenings for 10 years. Then catch atypical pneumonia early in a hot summer and let your life be saved by aureomycin. During weeks of slowly dawning vigor remember that it's later than you think and resolve to reduce home work.

Buy silk, paints, squeegee stuff. Create, but accept no advice or instructions, in order to preserve your untutored style. Start copying flowers from old magazines, branch out to Audubon's birds, try a Van Gogh or two to learn about color, and finally grit your teeth, gird your loins and paint your own flowers to reproduce in quantity later. Avoid faces and figures if you value your new ego. Your only remaining problem will be to find enough friends to accept prints so that shelves do not collapse under the growing weight.

After you become famous and a bore to visitors, exhibit at an International Art Show (for Chemists) and get photographed while saying "cheese." The result will be outstanding among a series of dead-pan portraits and everyone will ask what story you just told.

BOOKS

Penicillin

PENICILLIN—Its Practical Application. Under the general editorship of PROFESSOR SIR ALEXANDER FLEMING, M.B., B.S., F.R.C.P., F.R.C.S., F.R.S., Professor Emeritus of Bacteriology, University of London; Principal Wright-Fleming Institute of Microbiology, St. Mary's Hospital Medical School, London, England. Cloth. 491 Pages; 63 illustrations and charts. Published by Butterworth & Co. Ltd., London, England, and C. V. Mosby Co., St. Louis, Missouri, U.S.A. 1950.

THIS is the second edition of the only complete work describing the history of penicillin as well as its use. It is masterfully compiled under the general editorship of the discoverer of this most useful therapeutic agent, SIR ALEXANDER FLEMING.

The introductory chapter entitled the "History and Development of Penicillin," as well as the preface and the chapter entitled "Bacteriological Control of Penicillin Therapy," are written by DR. FLEMING himself; the remaining chapters are by 34 of England's outstanding physicians and surgeons. In the introductory chapter DR. FLEMING has mentioned his own work in 1929, and goes back to 1889 to give Pasteur the credit for the first studies with what came to be termed "antibiotics." He describes the early studies in isolating this mould and ends the chapter with some general rules for penicillin treatment, thus: "In penicillin we have a remarkable chemotherapeutic agent.... other powerful antibacterial agents have been discovered but so far penicillin stands alone in combining this property with an almost complete lack of toxicity.... There is still plenty of scope for further advance."

The next three chapters detail meticulously the Chemistry, Pharmacy and Pharmacology of Penicillin. Then follows the chapter "Bacteriological Control of Penicillin Therapy" which is interesting, particularly in its mention of penicillinase, of which little is heard but an understanding of which would help to explain most of the poor or disappointing results in penicillin therapy.

A chapter on the "Methods of Administration" is followed by one on "Prophylactic Use of Penicillin," which mentions its use in war wounds and ends with a discussion of the relative value of penicillin and the sulfonamides in prophylaxis.

About 300 pages then describe in detail the use of penicillin in practically every morbid condition to which human flesh is heir, including dental pathological conditions.

Even dumb animals are discussed in one chapter on veterinary medicine, with a lengthy discussion on the use of penicillin in bovine mastitis and its use in dogs, cats, even birds.

At this point a chapter on streptomycin mentions its history, bacteriology and general use, especially in tuberculosis.

A short chapter on "Penicillin Sensitivity" will bear careful consideration by those using the drug extensively. The writer comfortingly concludes: "The more recent penicillin preparations rarely cause local or general reactions."

A lengthy chapter especially for the use of gen-

eral practitioners is followed by one detailing the specific use of penicillin in acute infectious diseases.

A brief appendix describing penicillin resistance and a short description of some of the results obtained in the use of chloromycetin and aureomycin bring to a close this scientific but readable volume.

One is impressed by the inherent modesty of SIR ALEXANDER and his colleagues, and with the rapidly growing trend of the profession toward the use of penicillin routinely both prophylactically and therapeutically. He sagely remarks, "The lavish expenditure of antibiotic agents will not purchase an indulgence for therapeutic sins." His modesty is further evidenced by his citing the words of Earl Moore: "We are still in process of learning how to use this drug; we don't know yet and it is going to be some time before we are sure."

The closing paragraph is pregnant with hope for the medical profession who wrestle day after day for the complete annihilation of infectious diseases and the annoying appearance of what the surgeons of yesteryear were wont to call "laudable pus." "There will be new antibiotics appearing and it may be that the drug of choice in particular infections will change, but with each new one our armamentarium against infections will increase to the benefit of mankind."

—HENRY S. BROWN, M.D.

Amputations

AN ATLAS OF AMPUTATIONS. By DONALD B. SLOCUM, M.D., M.S. C. V. Mosby Co., St. Louis, Missouri, 1949 This 562-page book is a monumental contribution to the subject. It is excellently printed and profusely illustrated. It deserves a place in the library of all industrial surgeons and others who perform amputations or pass on the disabilities of amputees. The first chapter on "Orientation" could be read with profit by all surgeons, as it contains an excellent summary of the psychological aspect of the problems of the amputee. The discussion of the general indications for amputation might well be presented in the surgical clinics given senior medical students. The majority of surgeons perform only an occasional amputation, but they will find it profitable to read the chapter on the surgical care of the individual tissues. The author opposes the use of alcohol injections in nerve stumps and finds little to recommend refrigeration anesthesia. He discusses the serious problem of the "phantom limb" and admits that it is still unsolved.

This book is an excellent reference for review of the technique of various amputations. The discussion of hand and finger amputations in relation to the occupation of the patient is particularly thorough and sound. The same may be said for the chapter on the toes and foot.

The manufacturers of prosthetic devices should study the beautifully illustrated chapter on the mechanics of gait. The stroboscopic photographs made by the celebrated Gjon Mili are of exceptional interest. Too many surgeons feel that their responsibility to the amputee ends when he is turned over to the physiotherapist or prosthetic maker for rehabilitation. A study of this volume should be a valuable aid to any surgeon in dealing with a patient who requires an amputation, from the time of injury to his final reassignment to a suitable place in society. The book is highly recommended.

—CHESTER C. GUY, M.D.

Model Code, from Geneva

MODEL CODE of Safety Regulations for Industrial Establishments for the Guidance of Governments and Industry. Geneva, International Labour Office, 149. Pp. 483, with Supplement (Index and Corrigenda).

REPRESENTING the end results of a six-year period of preparation, this *Model Code* was approved by a Tripartite Technical Conference held in Geneva in 1948 pursuant to a decision of the Governing Body of the International Labour Office. The work now is placed at the disposal of governments and industries merely for guidance. "It is not an instrument involving any binding obligations, and governments and industries are free to make such use of it as they see fit in framing or revising their own safety regulations."

In many detailed chapters the general safety subjects of "Premises of Industrial Establishments," "Fire Prevention and Protection," "Machine Guarding," "Electrical Equipment," "Hand Tools and Portable Power-Driven Tools," "Boilers and Pressure Vessels," "Furnaces, Kilns and Ovens," "Handling and Transportation of Materials," "Dangerous and Obnoxious Substances," "Maintenance and Repairs," and "Safety Organization" are outlined. However, of interest to the industrial physician are the suggested regulations and provisions for worker and workroom care in the handling of infectious, irritating, and toxic substances, such as carbon monoxide, lead, and phosphorus. Workroom isolation, construction of floors, atmospheric contamination control, time for use of washrooms, and contact prevention are well reviewed in the Code.

A separate chapter is devoted to "Dangerous Radiations," wherein in addition to a discussion of infra-red and ultra-violet radiations, the definitions for permissible dosages for ionizing radiations are given. The types and frequency of medical examinations, and the maintenance of health records are described, as are the protective devices and laboratory practices mandatory in the use of radioactive substances.

Compiled in a single chapter on health protection are the standards for drinking water, waste disposal, washing, eating, and change facilities in industry. In the same chapter on "Health Protection" are good descriptive provisions for local exhaust ventilation systems.

A separate section is devoted to the selection of workers and medical examinations, and an excellent set of purposes for pre-placement and periodic examinations is offered headed by the first: "to inform the workers of the maladies and deficiencies by which they may be affected and to indicate to them the institutions which would assist in the treatment of their condition." Compliance with this single statement would please many a worker hostile to the industrial health service who complains that the plant physician "never tells him anything."

One appendix lists the maximum allowable concentrations of harmful substances and another the minimum equivalent thicknesses of lead and other materials for protection against x- and gamma rays.

The work is loose-leaf (binding posts), well printed, and of attractive format. It will prove a valuable addition to the working library of the industrial physician, not only in evaluating his current plant health practices, but in establishing a new service in an industry introducing such a facility.

INDUSTRIAL MEDICINE AND SURGERY

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ESTABLISHED 1932

Publisher: A. D. CLOUD

Volume 20 JANUARY 1951 *Number 1*

A Fifty Year Old Medical Battlefield

NEAR to the village of Quemados in Cuba, stands a dilapidated wooden hut, little marked and little protected. Historically that may be the most important building in Cuba. There in the fall of 1900 were carried out the heroic and gallant experiments that, once and for all, banished the then accepted belief that yellow fever was disseminated by fomites. There, too, in another nearby hut-like structure, long ago destroyed by storms and time, were conducted the positive experiments that proved beyond peradventure that yellow fever was carried from victim to new victim by specific mosquitoes.

The U.S. Army Yellow Fever Commission was made up of Doctors Walter Reed, James Carroll, Artistide Agramonte, and Jesse W. Lazear. Of the work of this Commission, Osler has written: "Many scientific discoveries have afforded brilliant illustrations of method in research, but in the work of these men one is at a loss to know which to admire more—the remarkable accuracy and precision of the experiments, or the heroism of the men—officers and rank and file of the United States Army; they knew all the time that they were playing with death, and some of them had to pay the penalty! The demonstration was successful—beyond peradventure—that yellow fever could be transmitted by mosquitoes, and equally the negative proposition—that it could not be transmitted by fomites. An interval of 12 or more days was found to be necessary after the mosquito has bitten a yellow fever patient before it is capable of transmitting the infection. Lazear permitted himself to be bitten by a stray mosquito while conducting his experiments in the yellow fever hospital. Bitten on the thirteenth, he sickened on the eighteenth and died on the twenty-fifth of September, but not until he had succeeded in showing in two instances that mosquitoes could convey the infection. He added another to the long list of members of the profession who have laid down their lives in search of the causes of disease."

Praise for the Yellow Fever Commission and the brave enlisted Army personnel who bore the brunt of the experimentation has not been lacking although sometimes only bestowed belatedly. Belatedness marked the award of the Congressional Medal of Honor. After Lazear's death the pathetic little camp at Quemados was termed "Camp Lazear." No less appropriate is the great Walter Reed Hospital in Washington, D.C. The greatest monument to the Yellow Fever Commission and its intrepid associate personnel is the United States, a land no longer ravaged by yellow fever epidemics. If there be those who doubt the actuality of yellow fever in the United States, let it be recalled that in the then little city of Philadelphia in 1793, 10,000 persons died in three months. Well into the 1900's the people of every southern state during the summer months lived in continuous dread over the possible return of yellow fever.

What has this 50 year anniversary to do with occupational health? Let it be remembered that in 1849 a railroad was started across the Isthmus of Panama. This was not completed until 1855. Every railway tie cost the life of a workman, chiefly from tropical disease. Still later,

in 1881, was inaugurated the tragic effort of the French Canal Company. Before this enterprise was abandoned, about 1890, 20,000 employees lost their lives—victims of yellow fever, malaria, dysentery, typhoid and typhus. The undertaking by the United States to complete the Panama Canal was begun in 1904, and successfully terminated in 1914. This success was built around a highly developed program of industrial medicine and hygiene, although those terms probably never entered the records. The occurrence of yellow fever and all other prevalent tropical diseases was just as occupational under those circumstances as silicosis in a miner. For damaging dust, substitute a biting mosquito —both on the job. The construction of the Panama Canal may in truth constitute industrial medicine's highest mark of achievement. The Panama Canal to this day might not have been constructed—but for those tiny huts in Camp Lazear at Quemados, Cuba.

On this 50th anniversary, all of the forces devoted to occupational health pay tribute to that valiant band of Army personnel who so thoroughly banished yellow fever that scarcely a memory of this plague remains.

Acheson is Dead

THE NEWS wires on September 19 busily carried the story of the settlement of the estate of EDWARD G. ACHESON, whose death occurred many months earlier. News accent was upon money, and millions were mentioned. Opportunity for merited laudation was fully overlooked. The little known fact is that EDWARD ACHESON unwittingly was one of the industrial medical world's greatest benefactors. In indirect fashion, without design or desire, he prevented more silicosis than all physicians put together.

The story begins in 1891 in Monongahela, Pennsylvania. A then unknown young chemist, in a makeshift laboratory, was dabbling with a new scientific toy—the electric furnace. Using a plumber's pot as his crucible, he constructed electrodes to his liking, then packed in a mixture of clay and coke. He was hoping to make artificial diamonds. After cooling he poked into the mass but found no diamonds. Instead, something more valuable—carborundum. This was the first of the synthetic abrasives. Its dust is substantially harmless.

Prior to the ACHESON era, edged hand tools were in tremendous use—axes, scythes, cradles, adzes, hoes, machetes, hand ground cutlery, pocket knives, razors. One of the world's highest developed industries was grinding. All grinding was done on natural sandstones. A lesser industry was the quarrying and shaping of these stones, large and small. A common factory size was six feet in diameter and a foot thick. Mounted on a spindle, such a stone soon disappeared into dust and death. The nations looked to the United States for grindstones, and Grindstone City in Michigan furnished a superb quality. Cargoes by boat and train were started to far ports. Russia was the best customer. With every cargo was a supercargo . . . . silicosis. In these present harried days, in foolish fashion Russia has claimed that this country sought destruction by the scattering of the lowly potato bug. Seventy-five years ago a substantial charge might have been made by any industrial nation that destruction arrived with every lot of grindstones.

Innocence attended every industrial step. Visconti did not coin the term "silicosis" until 1870, before which time thousands of tons of millstones had been shaped and sold. In that same year Zenker carved the word "pneumoconiosis," but before that time, dust, regardless of suitable disease terms, had been taking its toll. Grindstone City, not to be outdone, provided its own mighty share of the disease.

No exposed "old-timers" have lived to tell the tale.

ACHESON, sweating over his primitive furnace, glared not at the grindstone industry. The truth is he did not know what he had achieved for many years. In time carborundum and its more harmless daughter, emery, came to dominate the grinding world. Sandstones were doomed. The sandstone millwheel industry was doomed, sickened and died. Silicosis as produced in the grinding industries died alongside. The more effective synthetic abrasives, without which there could have been no automobile industry, produce no silicosis.

Silicosis as an occupational disease, still is an industrial menace. Its current strongholds are mines, foundries and potteries. Its former site of mighty devastation, the grinding industry, is free from harm. It would be hard to find a natural sandstone grinding wheel in any substantial industry—just a few left as relics in the farmer's back yard.

All this is due to the accident of discovery—carborundum. ACHESON is dead, but if he made millions, blessings on those millions.

Johnson's

MUSTARD PLASTER

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EXTRA-LARGE SIZE

DIRECTIONS: Soak the plaster in lukewarm water (1 to 2 minutes) and apply to chest (front, side or back). Remove plaster when skin is thoroughly reddened, usually within 5 to 10 minutes.

CAUTION: Do not keep plaster on long enough to blister the skin—never over 15 minutes. If blistering occurs because plaster is left on longer than 15 minutes, apply Johnson's Baby Cream or Petroleum Jelly to soothe the irritated area. When used on children or adults with sensitive skin, place a layer of wet gauze or cloth between plaster and skin.

A Johnson-Johnson PRODUCT

for chest colds

The time-proved mustard poultice in modern, ready-to-use form

• The old-fashioned mustard poultice has long been recognized as sound therapy. For example, Blumgarten's "Textbook of Materia Medica, Pharmacology and Therapeutics," 1937, notes that rubefacients or counter-irritants are useful "to relieve pain and tightness in the chest and congestion and inflammation in the lungs."

• Whenever this type of treatment is indicated, you will find that Johnson's MUSTARD PLASTERS offer many advantages to your patients. Each plaster comes ready to use. Nothing to prepare. No mess. No fuss. On and off in a few minutes. Heats the spot, stimulates circulation, helps relieve chest colds, bronchitis, sore throat.

• Johnson's MUSTARD PLASTERS *are recognized and approved by the United States Pharmacopoeia.*

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ANACIN . . . The Anacin Industrial Unit provides 250 cellophane envelopes, each envelope containing two Anacin tablets. This package offers the advantages of cleanliness and convenience for dispensing to individuals. It also assures the proper dosage in every case. Anacin is preferred in so many industrial dispensaries because it not only gives fast relief from pains of headache, neuritis and neuralgia, but gives longer lasting relief than plain aspirin. When you order Anacin tablets, order them in this special sanitary industrial unit, 250 envelopes, or 500 tablets, for $2.85.

BISODOL POWDER . . . Packaged in a 16 oz. wide-mouthed bottle for easy, quick dispensing. There is no faster relief from upset stomach than that which BiSoDoL provides. $2.00 each.

BISODOL MINTS . . . For greater convenience, BiSoDoL is also packaged as mint tablets, 500 to the bottle. BiSoDoL Mints are so palatable that they may be taken without water, if desired. $1.70 for 500 tablets.

DRY-AID . . . Dry-Aid is an antiseptic first-aid powder which prevents infection and promotes healing of minor burns, cuts, scratches and mild skin irritations. It is easy to apply because it is packaged in a sprinkle type container. This product should be a "must" in every first-aid room. Packaged 120 grains to the container; priced $2.00 per dozen.

PETRO-SYLLIUM . . . A mineral oil emulsion for the relief of constipation. Available either plain (blue label) or with phenolthalein (red label). Pleasant to take, gentle, thorough in effect. Packaged in 16 oz. bottles, $8.80 per dozen.

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NEWS, COMMENT, OPINION

POSTURE plays a leading role in preventive medicine; its effects are far reaching. We physicians should pay more attention to it.

—*Ohio State M. J.*, November, 1950.

Muscle Test

THE following advertisement appeared in a physical culture magazine: "Here's a good test for your midsection muscles. Clasp hands overhead and place feet together on the floor. Now bend to the right at the waist as you sit down to the left of your feet. Then, by sheer force of your muscles, haul yourself up, bend to the left, and sit down on the floor to the right of your feet. Stick with it, and let us know the results." The next day a letter came in. It said simply: "Hernia!"

—From *Industrial News Rev.*, quoted in *West Virginia Med. Monthly*

Self-Preservation

LEADERS among the doctors maintain the view that doctor-owned prepaid medical plans are the profession's answer to socialism. Can it be that a profession may not defend itself by reorganization of its methods, by doing within the profession what has been compelled elsewhere by law; that, thus, to reorganize and seek to preserve its independent status makes an organized profession and its leaders criminals and subject to the injunctive power of the courts? In short, that organized medicine must remain a sitting duck while socialism overwhelms it? I would not expect an American court to hold that.

—From the opinion of the trial judge, U.S. District Court, District of Oregon, in Oregon Doctors' Anti-Trust Suit, in *Northwest Medicine*, November, 1950.

Debased One-Half

CAN you think of a handier and more popular device for power-hungry people to employ in obtaining support than promises to take good care of people when they get old—that is, later on? The "later on" is very important to the promiser; he gets the popularity he seeks today. As for paying up tomorrow—well, tomorrow is another day, and if necessary the currency can be debased. It has been in other times and places. In this country it already has been debased by nearly one-half since social security was first promised to numerous voters.

—ROBERT C. TYSON, Comptroller, U.S. Steel Corporation, quoted in *Minnesota Medicine*, November, 1950.

"Literary Lapses"

THE literary cliché is often used by the inexperienced writer. This places on the Editor the unpleasant duty of changing a contributor's copy. Among the more common words or phrases of this kind are: "significant contribution," "technique" (where method or procedure will convey the same meaning); "at the level of." One of the laziest of these tiresome expressions is to refer to a particular method of solving a problem as an "approach." Problems which are only approached seldom get solved!

—*Personnel Journal*, November, 1950

Prophetic

A FRIEND of ours once went to considerable pains to prove that there is "nothing new under the sun." The other day we ran across this uncannily prophetic quotation that seems to bear him out. It was written in the year 1834 by the French author, Alexis de Tocqueville. We quote it below without further comment: "Today there are two great peoples who, starting from different points, seem to approach the same destiny; they are the Russians and the Americans. Both of them have grown in obscurity, and, while men were looking the other way, they have suddenly reached the first rank of nations.... All other peoples seem to have nearly reached the limits of their potentialities.... But these two peoples are growing. These alone follow a course whose limit the eye cannot yet detect. The American battles the obstacles of nature; the Russian, those of man. The former combats the wilderness and savagery; the latter, civilization with all of its weapons. American conquests are won with the laborer's ploughshare; Russian triumphs with the soldier's sword. To attain its ends, the American relies upon personal interest and allows free scope to the unguided energy and common sense of individuals. The Russian

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PHYSICIAN, NOT OVER 50, to become associated with very large Company with numerous eastern plants; will have headquarters at home plant city; duties will include some relief work for two week periods in all plants; permanent; excellent pension plan. New Jersey. D1477.

LARGE HEAVY INDUSTRIAL MANUFACTURER requires well qualified, older physician, experienced in industrial work including minor surgery and fractures; exceptional opportunity for physician wishing to remain in this field; will consider several younger men. Maryland. D1676.

PHYSICIAN FOR GENERAL WORK, routine examinations, dispensary work and industrial surgery wanted by large western mining Company with excellently equipped hospital; substantial salary; extras for OB and minor surgery; private practice consultation privilege. Town 10,000. D424.

PHYSICIAN TO BE PRINCIPALLY RESPONSIBLE FOR THE industrial health functions at two smaller plants of large manufacturer. Should have some previous industrial experience preferably in the Clinical or Pharmaceutical industry. About $9000; Pennsylvania licentiate required.

FULL TIME POSITION IN LARGE SOUTHERN plant of national manufacturing company; excellent facilities; 2000 employees; opportunity exceptional as there is no company physician there now; city, 500,000 population; $7500 initially; increases. D892.

YOUNG PHYSICIAN TO ASSIST with general work, surgery and industrial medicine in association with older physician specializing in industrial work. Has excellent large surgical and industrial clinic; one of the larger cities in Oklahoma; substantial starting salary. D1193.

PHYSICIAN FOR GENERAL AND INDUSTRIAL WORK in association with physician with large industrial practice; very desirable town near Pittsburgh; must have car; good home available; $800; with extras should reach $1,000–$1200 after one month. D1451.

PHYSICIAN WITH GOOD INDUSTRIAL EXPERIENCE to associate with well established eight-man California group situated in highly industrialized city of 170,000; about $8000 initially; well known to us and thoroughly recommended. D1306.

MANY EXCELLENT OPPORTUNITIES EXIST IN THE CHICAGO AREA FOR INDUSTRIAL PHYSICIANS. THESE OPENINGS INCLUDE ASSISTANTSHIPS AND ASSOCIATIONS WITH INDUSTRIAL PHYSICIANS, IN PRIVATE INDUSTRIAL PRACTICE; STAFF APPOINTMENTS AND DIRECTORSHIPS IN LARGE MANUFACTURING COMPANIES, AND INDUSTRIAL GROUPS AND CLINICS.

somehow concentrates the power of society in one man. The method of the former is freedom; the latter, servitude. Their starting point is different, their ways are diverse, and yet each of them seems called upon by the secret design of Providence to control, some day, the destinies of half the world."

—From *J. Indiana Med. A.*, Dec., 1950.

"Off the Job"

W. W. BAUER, M.D., editor of *Hygeia*, says in his book "Santa Claus, M.D.," just published: "We talk too much about industrial health and industrial hazards. What we really mean is the health of the people who work in factories, mines, stores or offices, and who drive our transport vehicles. About nine times out of 10, the state of their health is determined more by how they live off the job than by what happens to them on the job."

Everybody Loses

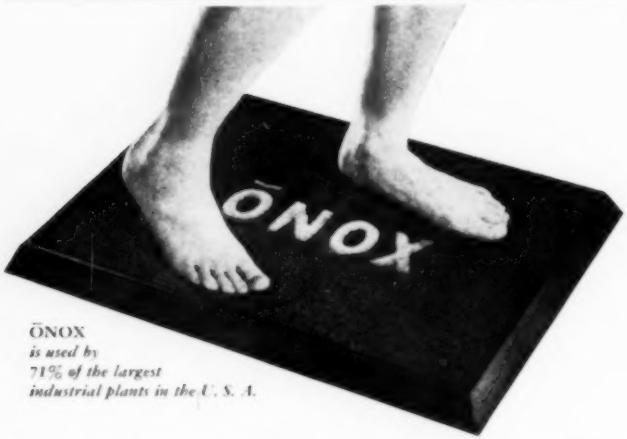
THE practical viewpoint that everybody loses in the event of a loss shaped the thought of insurance leaders some years ago to the possibilities of loss prevention service. Since that time considerable progress has been made in this field with the development by many companies of departments whose main objective was to seek out the causes of accidents, fires, explosions, etc., and to discover means to prevent them. This one-time by-product of the business has become one of its major concerns in recent years with the result that many companies pride themselves today as much on their ability to discover and check hazards in industry and personal life as they do on the ability to pay claims.

—From "Tangible Insurance," in *United States Review*, November 25, 1950.

St. Vincent's, New York

FROM the waterfront, too, come longshoremen injured from falls into ships' holds. But the majority of industrial mishaps that find their way to St. Vincent's stem from the meat-packing and garment industries. Butchers slip with their cleavers and knives; garment workers tangle with needles and shears. There are also the occupational hazards of the police. The busiest night in St. Vincent's recently was when a half-dozen policemen were overcome by illuminating gas while investigating a suicide in a West Side tenement.

—From "Hands on the Pulse of the City," by HERBERT BAUMGARTNER, in *New York Herald-Tribune*, November 19, 1950.



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industrial plants in the U. S. A.

Horse sense about ATHLETE'S FOOT

91 skin specialists condemn old-fashioned foot baths as being "illogical and potentially harmful to the skin."
(Archives of Dermatology and Syphilology for April, 1942.)

The best way to prevent Athlete's Foot, say these specialists, is to *stop* trying to disinfect the feet. Concentrate instead on improving the condition of the skin.

✓ *A sound skin is nature's best protection against fungus attack*

That is good horse sense. And it's the basic principle of the Onox skin-toughening method of Athlete's Foot prevention. Instead of disinfecting the feet, Onox mineral salts toughen the shoe-softened skin *and restore its natural resistance to fungus growth.* No fungus growth—no Athlete's Foot.

The above statements are substantiated in tests made by Pease Laboratories, Inc. of New York, and the Department of Bacteriology of a large University. A summary of these tests is available on request.

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Originators of the skin-toughening method of Athlete's Foot Prevention

Nothing New to Offer

AFTER a thorough study of all available data on the therapy of the common cold one is inclined to remember an account of therapy used more than 50 years ago: "We were rubbed lavishly with hot grease" . . . . "stinging plaster made of mustard and white flour" was applied . . . . "We used to sit for half an hour before bedtime with our feet in a pail of hot mustard water. Then we were put to bed surrounded by hot soapstones, and in the morning we were damp but cured." It seems doubtful whether modern science has much more to offer in the treatment of the common cold.

—From "The Common Cold—Fact and Fancy," by E. JAWETZ, M.D., and J. C. TALBOT, M.D., in *California Med.*, 73: 5, 379 (November) 1950.

Excessive Drinkers

AS COMPARED with non-abstainers, eight distinct classes of insured users of alcoholic beverages reflect mortality more than three times the expected rates, according to the conclusion reached in the most extensive study of insured drinkers since the repeal of prohibition, reports the American Business Men's Research Foundation. This study has just been made public by Walter Menge, Vice-President, Lincoln National Insurance Company, Fort Wayne, Indiana. In a personal communication to the Foundation, Mr. Menge says that the over-all average, 310% ratio of actual to expected mortality, was based on a study of Alcoholic Habits Cases—an analysis which includes 72,658 policy years, 758 death claims. "The number of deaths incurred during the period of this investigation among a group of excessive drinkers was over three times the mortality that would have been expected from a group of standard lives similarly distributed with respect to age and amount of insurance." The reported number of deaths recorded as due to alcoholism is an understatement, much lower than the actual number, the reason being that physicians are inclined to record deaths as due to other causes out of consideration for the families and friends of deceased alcoholics. Commenting on the findings of the study, Mr. Menge says: "This sharp increase in violent deaths is not surprising, since alcohol in its action on the brain has the effect of throwing off the governor."

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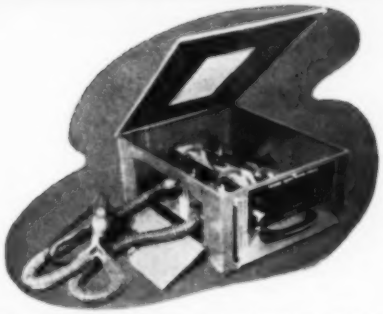
The ONLY Continuous Positive Pressure Breathing Machine



A VALUABLE THERAPEUTIC ADJUNCT TO THE TREATMENT OF

- ***acute pulmonary edema***
- ***severe asthma***
- ***obstructive lesions of larynx or trachea including obstructive dyspneas***

In these conditions the action of oxygen or helium-oxygen mixtures is two fold. The physical effort of the subject is decreased consequently decreasing dyspnea and counteracting internal hydrostatic pressure.

For Use With Both Oxygen And Helium-Oxygen Mixtures

References:

1. *Pressure-Breathing with oxygen and Helium-oxygen in Pulmonary Edema and Obstructive Dyspnea, Helen A. Barkerman, M.D., Bulletin of the New York Academy of Medicine, June 1950, Vol. 26, No. 6.*

2. *Physiological Therapy in Respiratory Diseases, Alvan L. Barach, M.D., Chapter 7, pages 120-121, 131, 136; Chapter 8, pages 162-164; Chapter 25, pages 359-361.*

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For "Athlete's Foot"

A NEW chemical remedy which is reported to give "quite impressive results" in treating ringworm of the scalp in children, athlete's foot and other fungus infections of the skin, was announced at a meeting of the New York Academy of Sciences in New York. The new drug is called "Asterol." It belongs to the class of chemicals called benzothiazoles. The general anti-fungus power of these chemicals led Dr. Norbert Steiger, of the Hoffmann-La Roche Company, Nutley, New Jersey, to put together the compound called Asterol for short. Chemically, it is 2-dimethylamino-6-B-diethylaminoethozybenzothiazole. Although possessing quite high anti-fungus activity, the new chemical has a low toxicity and is entirely without skin-irritating effect, tests have shown. Results of the use of Asterol for ringworm of the scalp in children and athlete's foot were reported by Dr. Frederick Reiss, of New York University-Bellevue Medical Center, New York, and Dr. Conrad Stritzler and associates, of Queens General Hospital, Jamaica, New York. Asterol will not be available for commercial sale until the early spring of 1951 because of the need for additional manufacturing facilities. The team of Hoffmann-La Roche which reported to the membership of the New York Academy of Sciences on the new ringworm and athlete's foot treatment consisted of Drs. E. Grunberg, G. Soo-Hoo, E. Titsworth, D. Ressetar and R. J. Schnitzer. Dr. Grunberg described the laboratory studies leading to the discovery of Asterol.

Science Newsletter, November 11, 1950.

WHO and ILO Study

A PRELIMINARY investigation of the effects of modern industrial methods on the health and life expectancy of workers has been recommended by a committee of experts on industrial hygiene, appointed jointly by the International Labor Organization and the World Health Organization, meeting for the first time during August in Geneva. The proposal arose from a suggestion in a memorandum submitted by the American Federation of Labor. After consideration, the joint committee pointed out that the investigation would be a difficult and highly complicated one which would embrace many fields, such as the physical, social, and economic background and qualities of the individual worker. It was the opinion of the committee that "as a first step, the present knowledge in this field should be assembled and arranged in an orderly fashion." Training in occupational medicine of doctors and auxiliary medical personnel was another item on the agenda. It was recommended that adequate instruction in occupational health be given all medical students; that more intensive instruction be provided for doctors and medical students who intend to devote themselves especially to the practice of occupational health, with the awarding of a special diploma to those completing the course

even in stubborn

slow healing **wounds**

burns

ulcers

(decubitus, varicose, diabetic)

accelerates healing

New clinical studies[1] again prove the ability of Desitin Ointment to ease pain, inhibit infection, stimulate healthy granulation, and accelerate smooth epithelization in lacerated, denuded, ulcerated surface tissues . . . often in conditions resistant to other therapy.

protective, soothing, healing **Desitin Ointment** is a self-sterilizing blend of high grade, crude Norwegian cod liver oil (with its unsaturated fatty acids and high potency vitamins A and D in proper ratio for maximum efficacy), zinc oxide, talcum, petrolatum, and lanolin. Does not liquefy at body temperature and is not decomposed or washed away by secretions, exudate, urine or excrements. Dressings easily applied and painlessly removed. Tubes of 1 oz., 2 oz., 4 oz., and 1 lb. jars.

write for ***samples*** *and reprint*

Desitin CHEMICAL COMPANY
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1. Behrman, H. T., Combes, F. C., Bobroff, A., and Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.

and passing an appropriate test of competency; and that sufficient and suitable instruction be given graduate nurses, nurses in training, social and welfare workers in training, first-aid workers, industrial hygienists, chemists, engineers, physicists, and others employed in controlling the occupational environment. The committee also reviewed the activities of the ILO and the WHO in the field of industrial hygiene and recommended that liaison be maintained to insure "the closest possible collaboration between the two organizations." The meeting was attended by five members appointed by the ILO and four named by the WHO. SIR JOSEPH BHORE, chairman of the Indian Health Survey and Development Committee, an ILO-appointed member, was elected chairman of the committee meeting. Also appointed by the ILO were DR. LEONARD GREENBURG, executive director of the Division of Industrial Hygiene, New York State Department of Labor; PROF. PIERRE MAZEL, of France; and DR. E. R. A. MEREWETHER, of the United Kingdom. The four members appointed by the WHO were DR. B. KESIC, of Yugoslavia; DR. LEO NORO, of Finland; DR. ISMAEL URBANDT, of Argentina; and DR. A. UYTDENHOEF, of Belgium.

—Labor Information Bulletin, November, 1950.

ATTENTION MEDICAL DIRECTORS:

During the last national emergency DOMEBORO Solutions served in maintaining industrial health and in combatting loss of manpower due to absenteeism.

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Atherosclerosis

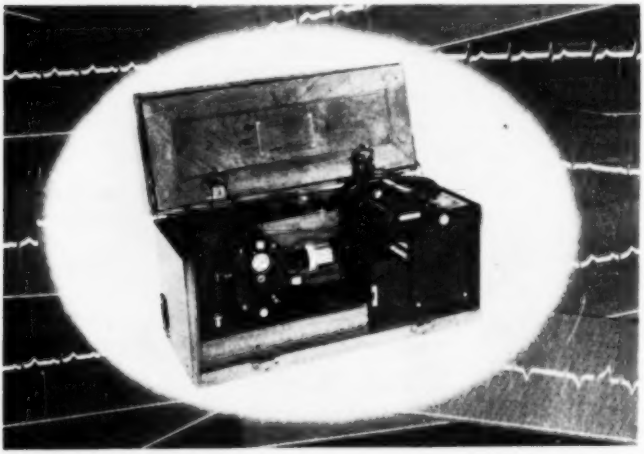
THE attack, via fat, on one kind of artery disease which causes many heart deaths will be intensified with a war fund totalling $230,773 just granted by the U.S. National Heart Institute to four non-federal research institutions. The artery disease is known as atherosclerosis. Its consequences are responsible for 40% of the 750,000 heart and artery disease deaths each year in the United States. It can affect younger as well as older persons. Fat molecules in the blood have been implicated as the cause of this artery disease. Further research on this point will be pursued under the grants to University of California, Harvard School of Public Health, Cleveland Clinic and the University of Pittsburgh.

—*Science News Letter*, September 23, 1950

Industrial Dermatitis

THE practice of an industrial dermatologist is an excellent barometer of the financial status of the nation, said DR. JOHN G. DOWNING, Boston, at the ninth annual meeting of the Academy of Dermatology and Syphilology, at Chicago. Speaking about "simulation and self-infliction as encountered in industrial dermatology," DR. DOWNING noted that during the lush period of the war there were no cases of malingering, but that during the early 1930's frequent cases of self-inflicted injury to the skin by persons seeking to collect

compensation claims were encountered. "During the first two months of 1949, cases for claims for slight eruptions increased. In times of economic stress workers feel that someone should take care of them." Distinguishing between true industrial dermatitis, i.e., skin injury clearly caused by chemicals or materials with which the employee comes in contact in his work, and simulated dermatitis, deliberately brought about for the collection of compensation, is difficult. The largest group of offenders are those who have suffered an occupational dermatitis at one plant, and have been treated and obtained compensation, often a lump sum settlement, and then secure the same type of employment at another plant, deliberately exposing themselves again to the same irritant, and seeking to collect for the second injury. The next largest group are those suffering from such chronic diseases as psoriasis and eczema, who get a job and are able to work, but if they sense a layoff coming, report an eruption on the skin, claim it is due to their occupation, and ask for compensation. The third group, those who deliberately injure their skins, through the use of powerful chemicals, scratching and breaking the skin, implanting irritating foreign substances under the skin, etc., are the most baffling cases the physician, claims board and insurer have to face, with the physician doing the detective work to ferret out the cause of the injury. In right-handed persons, injuries are on the left side, and the reverse in left-handed persons.



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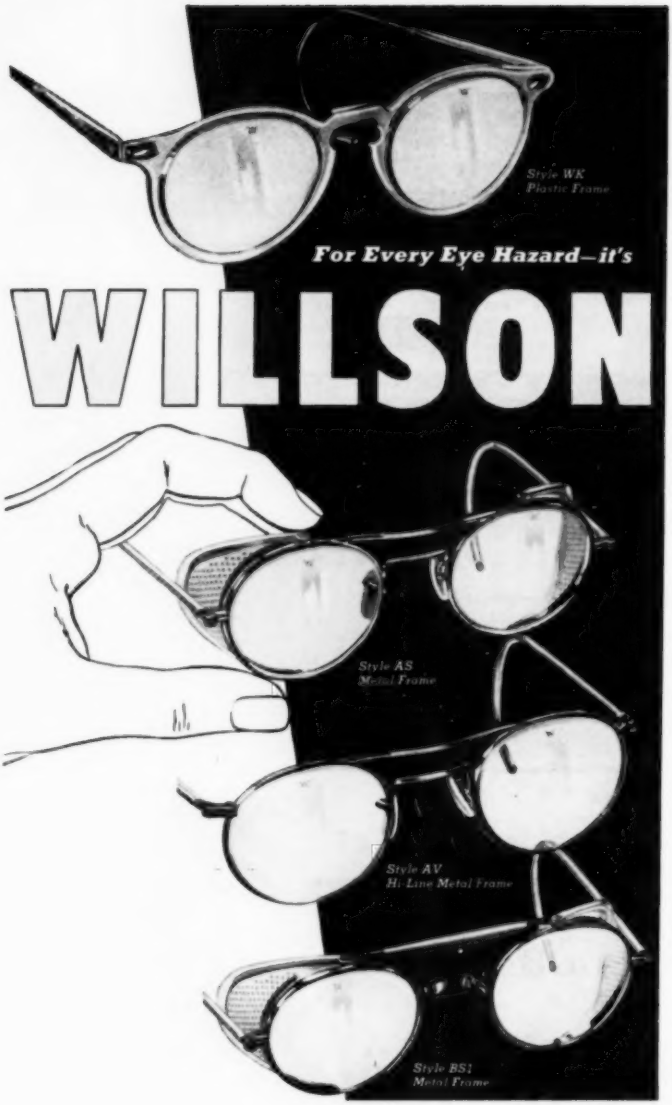
get into a "hot" war or not, we believe the stage is set for a military force of 3,000,000 men at all times. We must face the facts and set our house in order. Our hospital trustees say that we cannot compete with war industry in payment of wages. Employees, therefore, will be leaving us for war plants. Volunteers will again be seen in our halls. During the last war the volunteers were some of our most intelligent workers. They came from our finest homes, and with college educations. Men and women came from banks, law offices, and all kinds of businesses and did a fine service in the afternoons and evenings and on week-ends.

—PAUL C. ELLIOTT, in *Hospitals*, 24:22 (November) 1950.

Early Ambulation

EARLY ambulation after surgery means getting out of bed as soon as possible, usually in the first 24 hours. There are some exceptions, of course, but when the procedure is used, it is simple. With the assistance of nurses and often the attending physician, the patient is moved to the side of the bed where he is helped to a sitting position with the feet swung over the side of the bed. Next, the patient steps to the floor and then sits in a comfortable chair, usually for just a few minutes. The next attempt is of longer duration. On each attempt the patient is encouraged to breathe deeply to prevent pulmonary complications, such as blood clots and pneumonia. Early rising speeds up the circulation, which



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greatly lessens the formation of dangerous blood clots and improves circulation to the operative wound, with quicker healing. Other advantages include improved urinary bladder and bowel function, with lowered incidence of vomiting, distention, gas pains, and constipation.

—Educational Committee, Illinois State Medical Society.

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—DONALD K. DAVID, Dean, Harvard Graduate School of Business Administration, quoted in *New York World-Telegram*, November 16, 1950.

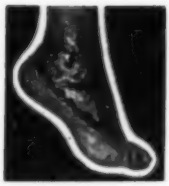
Some Employee Aids

INDUSTRY, too, should concern itself with the general health state of its workers, with causes of illness not directly the result of work processes and working conditions. Their place of work is the best place to reach employees with health protection—x-ray to find tuberculosis, tests to locate venereal disease, immunization against smallpox and typhoid, dental examinations, early checks for mental disease and nutrition education. These are, only some of the aids that can be brought to the plant, benefiting both management and workers.

—GEORGE TURCH, at a Public Health Institute in Grand Rapids, Michigan; from *Grand Rapids Press*, November 14, 1950.

Salt and Soda Water

SIMPLE rules for using salt and soda water by mouth as first aid for serious shock from burns are outlined in a leaflet issued by the U. S. Public Health Service. In the leaflet, "The A.B.C.'s of Salt and Soda for Shock in Burns," Surgeon General Leonard A. Scheele points out that "in the salt and soda solution, given by mouth, we have a practical and highly effective first aid against shock, the major killing



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factor in burns and many injuries." The text emphasizes that any badly burned person needs the care of a doctor as soon as possible. He also needs first aid for shock immediately. He may be saved from shock—and even death—by giving him salt and soda in water to drink at the earliest possible moment. The salt solution consists of one level teaspoon of common table salt and ½ teaspoon of baking soda (bicarbonate of soda) dissolved in one quart of cool water. A burned person should drink this, and nothing else. As much as 10 quarts in 24 hours may be necessary. Single copies of the leaflet may be obtained from the Public Health Service, Washington 25, D.C.

Public Confidence

NO PROFESSION ever has had a more spectacular demonstration of public confidence than that given to American doctors in their nation-wide October advertising program. "Never before has one profession, business or industry found thousands of unrelated groups, in virtually every area of the country, coming forward in its defense," Miss Leone Baxter told a joint session of the A.M.A. House of Delegates and the Third Annual Conference of the National Education Campaign. Pointing out that the purpose of the advertising program was to prove that the American public does not want a government-directed medical system and is with medicine in the battle against compulsion, she said people in every corner of the country came forward "to state their views, to take their public stand with medicine, and to spend two million dollars of their own money to do it." She reported that more than 65,000 businesses, organizations and individuals bought space in their local papers to advertise their support of medicine's campaign for freedom, adding: "This support did not come from 'big business' and 'reactionary interests.' It came, with real grass roots strength, from tens of thousands of small advertisers along the Main Streets of America—from drug stores, groceries, dairies, hardware stores, insurance agents, banks, movies, utilities, churches, medical care plans, dry goods stores, hospitals and clinics, restaurants, laundries and plumbers." Supporting radio spot announcements, contributed by friends of medicine, totaled 35,362, with 200 out of 1,600 radio stations still unreported.

—Whitaker and Baxter release

Brain and Spinal Cord Tumors

A HIGH degree of accuracy in detecting and localizing brain and spinal cord tumors by using a radioactive dye is reported by a group of Chicago medical researchers after a study of 200 suspected patients. A 95.5% accuracy in diagnosis of tumors of the central nervous system is revealed in the December 23 issue of *J.A.M.A.* The report was made by Drs. Loyal Davis, John Martin, Moses Ashkenazy and George V. LeRoy, and Theodore Fields, B.S., all associated with the Department of Surgery, Northwestern University Medical School and Hines Veterans Administration Hospital radioisotope unit, Chicago. The study was begun in July, 1949, and is still being carried on. Since the initial report citing 200 patients was submitted to the Journal, hundreds more have been examined. Dr. Davis estimated that approximately 500 patients now have been studied and diagnosis made "with the same degree of accuracy." The radioactive substance used is called diiodofluorescein—a chemical iodine dye compound. It is furnished by the Isotope Division, Oak Ridge National Laboratory, United States Atomic Energy Commission, to commercial pharmaceutical laboratories for preparation of the final product used in the examinations. This radioactive dye has an affinity for tumor tissue, the surgeons said, reporting that "the more malignant the neoplasm (tumor) the greater the radio-

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fluorescein concentration." By using radiation detection equipment the concentration is located, revealing the site of the tumor. Dr. Davis credits Dr. G. E. Moore, Minneapolis, with first conceiving this method of tumor detection but "it was first put to practical use in our study," he explained.

—A.M.A. release, December 22, 1950.

The Alarm Reaction

RECENTLY, I have become aware of the work of Hans Selye and his theories concerning an alarm reaction, the general adaptation syndrome, and the diseases of adaptation. Although he has not mentioned the common cold per se in any of his papers that I have read, from my understanding of his theories I feel strongly that the explanation of many of the mysteries of the common cold lies concealed in the pathologic physiology displayed by the body in its effort at defense. In 1946, in a comprehensive review of the subject, Selye defined the alarm reaction as "the sum of all nonspecific systemic phenomena elicited by sudden exposure to stimuli to which the organism is quantitatively or qualitatively not adapted." He further states: "It is becoming increasingly more obvious that certain physiologic mechanisms, in which the endocrine system plays a prominent part, help to raise resistance to damage as such, irrespective of the specific damaging agents. Some of the most important diseases (such as hypertension, nephrosclerosis and the rheumatic diseases) may represent by-products of the endocrine reaction, which are at play in the general adaptation syndrome." In his detailed discussions of the syndrome Selye cites symptoms and signs that are extreme and unmistakable. For example, in shock, which is described as the primary phase of the alarm reaction, he lists tachycardia, decrease in muscular tone and body temperatures, formation of gastric and intestinal ulcers, hemoconcentration, anuria, edema formation, decrease in blood chlorides, acidosis, a transitory rise followed by a decrease in blood sugar, leukopenia followed by leukocytosis and discharge of adrenalin from the adrenal medulla. He states, "This phase may last anywhere from a few minutes to 24 hours, depending on the intensity of the damage inflicted, but unless the termination is fatal it is always followed by the counter-shock phase. The latter is characterized by a reversal of most signs characteristic of the shock phase. Thus there is blood dilution and increase in blood volume, increase in blood sugar, and blood chlorides, alkalosis, diuresis, and often a rise in body temperature." After discussion of the stages of resistance and exhaustion he states, "These observations .... led to the conception that any non-specific noxious agent which causes sudden general systemic damage elicits the shock phase of the alarm reaction, probably because it liberates toxic metabolites from the tissues. The theory was proposed that if the damage is not too

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severe and hence permits survival, the damaging agent (perhaps through a hypothetical toxic metabolite produced under its influence) acts on the anterior lobe of the pituitary and stimulates it to discharge adrenotropic hormone. This in turn stimulates the adrenal cortex to produce an excess of corticoid hormones which help to raise the resistance of the body and elicit the characteristic counter-shock phenomena .... This defensive endocrine response is valuable inasmuch as it facilitates adaptation to stress (e.g., infections, intoxications, nervous commotions, cold, etc.,) but the resulting endogenous hormone overdosage may become the cause of certain cardiovascular, renal and joint diseases. Thus developed the concept that many of the most common maladies of man are diseases of adaptation, that is to say, the by-products of abnormal adaptive reactions to stress." Since the foregoing was published in 1946 a great volume of experimental work has been conducted using pituitary adrenal corticotropic hormone (ACTH), and the literature has been filled with reports of the astonishingly good results obtained.

—From "The Alarm Reaction," by JOHN M. BREWSTER, CAPTAIN (MC), USN, in *West Virginia Med. J.*, December, 1950.

Courses

THE University of Michigan School of Public Health has prepared an In-service Training Course in Radiological Health, February 5-8, 1951, at Ann Arbor. The four sections of the course are "Orientation;" "Ways Ionizing Radiations are Used;" "Biological and Medical Effects;" and "Public Health Implications." Detailed information may be obtained from H. E. MILLER, School of Public Health, 109 South Observatory Street, Ann Arbor, Michigan.

COLUMBIA UNIVERSITY, School of Public Health, offers courses in Industrial Medicine, 1950-51: (201) A non-technical presentation of the historical background, the place and scope of medicine in industry, the relationships of occupation to disease, and the place of industrial hygiene in public health work. (202) A detailed discussion of the incidence, diagnosis, prevention, and treatment of the principal occupational diseases. (203) A critical study of various medical care plans in industry, including union welfare funds, sick benefit and pension plans, workmen's compensation, and all types of health insurance as applied to employed groups. (204) The application and interpretation of laboratory procedures of importance in the diagnosis and prevention of occupational diseases including tests applied to the individual and to the environment. Lectures and demonstrations. Subjects including organization, administration, and recent developments in industrial medicine, are discussed. Information may be obtained from the Office of the Director, School of Public Health, 600 West 168th Street, New York, 32, New York.

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*Derzavis, J. L.; Rice, J. S., and Leland, L. S.: Topical Bacitracin Therapy of Pyogenic Dermatoses; a Clinical Report, J. A. M. A. 141:191 (Sept. 17) 1949.

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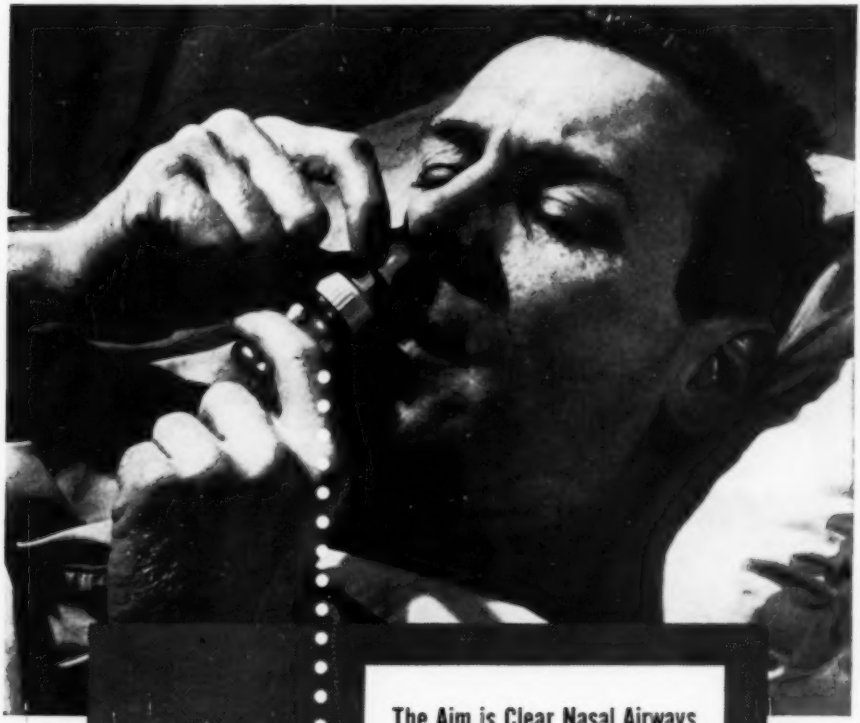

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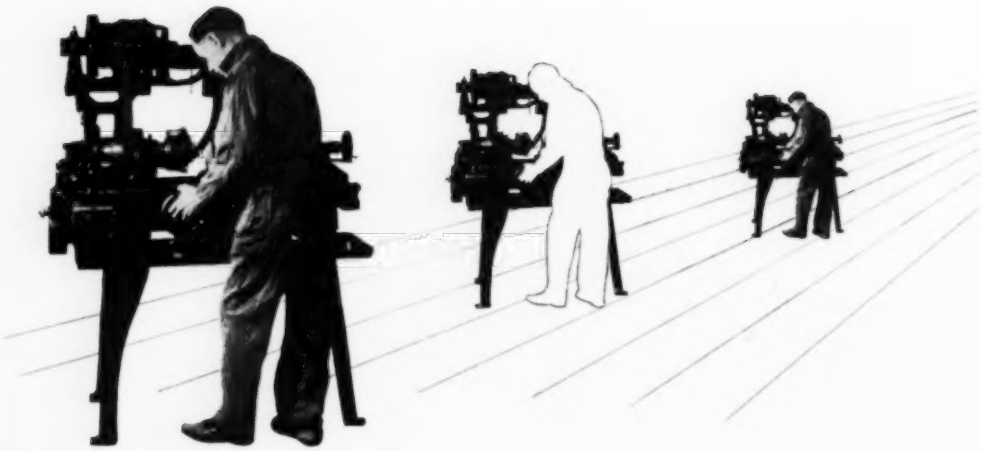

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*Bulletin of Florida State Dept. of Agriculture, No. 123, pp. 20-23.

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*Proc. Soc. Exp. Biol. and Med., 1934, 32, 241-245; N. Y. State Journ. Med., Vol. 35, 6-1-35, No. 11, 590-592; Laryngoscope, Feb. 1935, Vol. XLV, No. 2, 149-154; Laryngoscope, Jan. 1937, Vol. XLVII, No. 1, 58-60

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undisturbed
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Geigy

1. Couperus, M.: J. Invest. Dermat. *13*:35, 1949.
2. Patterson, R. L.: Southern M. J. *43*:449, 1950.
3. Peck, S. M. and Michelfelder, T. J.: New York State J. Med. In press.
4. Tronstein, A. J.: Ohio State M. J. *45*:889, 1949.

EURAX (brand of crotamiton) Cream: 10% N-ethyl-o-crotonotoluide* in a vanishing cream base supplied in tubes of 20 Gm. and 60 Gm. and jars of 1 lb.

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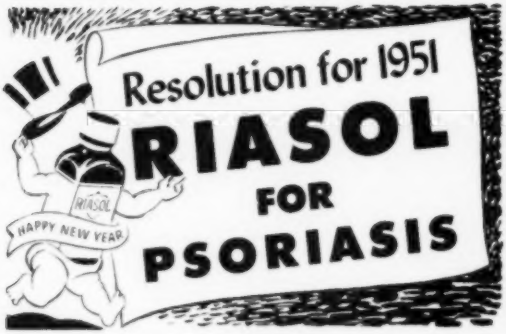

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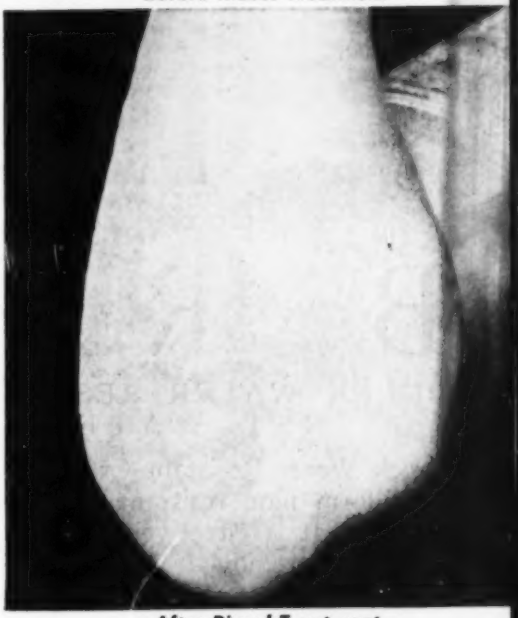

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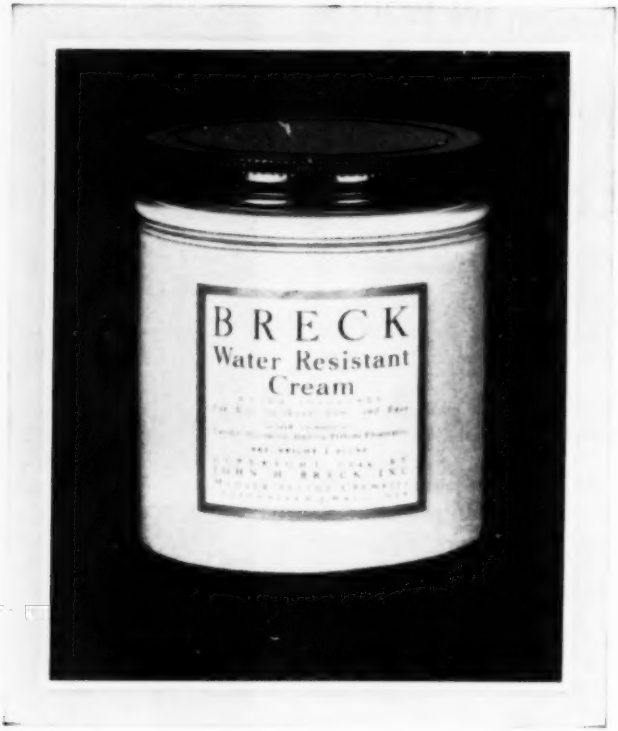

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Ziem, C.V. - So. Med. & Surg. 101: 308, 1940.

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